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AUTHOR	Bobbitt, Frank; Doss, Howard
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ABSTRACT

The publication was prepared for the United States Office of Education for use by teachers who direct agricultural training programs in safe tractor operation and safe farm machinery operation that comply with the United States Department of Labor regulations on hazardous occupations in agriculture. Upon successful completion of these training programs, 14 and 15 year old youths may receive a "Certificate of Training" which permits them to apply for and accept employment as farm tractor and machinery operators as defined on the certificate. The training program is presented in two parts: one for safe tractor operation (a minimum of 15 hours of instruction required), and one for safe farm machinery operation (a minimum of 10 hours of instruction required plus completion of the tractor program). Emphasis is placed on developing the skills and knowledge needed for safe tractor and machinery operation and developing an understanding of safe operating principles. An item-by-item outline is provided, followed by anticipated problems, questions, and concerns of students, suggested activities, and references for each unit. The relevant section of the Federal Register is appended. (Author/BP)

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CENTER FOR RURAL MANPOWER AND PUBLIC AFFAIRS
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SAFE

TRACTOR and FARM MACHINERY OPERATION

State of Illinois
BOARD OF VOCATIONAL EDUCATION AND REHABILITATION
DIVISION OF VOCATIONAL AND TECHNICAL EDUCATION
1035 Outer Park Drive
Springfield, Illinois 62706

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This publication was prepared for the U.S. Office of Education for use by teachers who direct agricultural training programs in Safe Tractor Operation and Safe Farm Machinery Operation that comply with U.S. Department of Labor Regulations on Hazardous Occupations in Agriculture.

VOCATIONAL AGRICULTURE TRAINING PROGRAM

SAFE TRACTOR OPERATION

SAFE FARM MACHINERY OPERATION

Revised By:

Frank Bobbitt
Vocational Education Specialist
Secondary Education and
Curriculum Department
College of Education

Howard Doss
Agricultural Mechanization Specialist
Agricultural Engineering Department
College of Agriculture and
Natural Resources

Center for Rural Manpower and Public Affairs

MICHIGAN STATE UNIVERSITY

This publication was prepared for the U.S. Office of Education for use by teachers who direct agricultural training programs in safe tractor operation and safe farm machinery operation that comply with the U.S. Department of Labor regulations on hazardous occupations in agriculture. Upon successful completion of these training programs, 14- and 15-year-old youths may receive a "Certificate of Training" which permits them to apply for and accept employment as farm tractor and machinery operators as defined on the certificate.

An advisory group assisted in the development of this publication, consisting of William Wheeler and Peter Zaldokas, vocational agriculture instructors at Webberville and Williamston, Michigan; Duane Dalgleish, consultant, Vocational Agricultural Education, Michigan Department of Education; Homer Edwards, V.T.E. program officer for agricultural education, Office of Education, D.H.E.W.; and Phillip P. Schmidt, youth specialist, Farm Division, National Safety Council.

This publication is a revision of Special Paper No. 8, written by Neil O. Snepp, Department of Secondary Education and Curriculum / Rural Manpower Center, Michigan State University.

Second Revision January, 1973

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Appreciation is also given to Prof. Robert G White, extension agricultural engineer, Agricultural Engineering Department, Michigan State University, for his excellent technical assistance with our section on safe farm machinery operation.

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Members of our advisory group

H. B. Goolsby, extension agricultural engineer, Cooperative Extension Service, University of Georgia

Gordon Ferguson, graduate assistant, Michigan State University

Farm machinery manufacturers

Editorial assistance from Sandy Clark.

Frank Bobbitt

Howard Doss

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INTRODUCTION

Agriculture has long been considered a hazardous occupation. Rapid mechanization, larger, more complex machinery and increased horsepower have not reduced the dangers. Vocational agriculture teachers have traditionally included safety instruction in their curricula, but recent concern for the safety of young farm workers has made it imperative that increased emphasis be placed on providing expanded instruction on the safe operation of farm machinery.

A new dimension to safety and labor problems was added on January 1, 1968, when the Secretary of Labor's order on hazardous occupations in agriculture became effective. This order, issued November 7, 1967, listed 16 types of jobs in agriculture that were considered "particularly hazardous" for youth under 16 years of age and prohibited their employment in these jobs. The intent of the order was to protect the well-being of youth. It presented problems to farm operators who had traditionally hired youth to cultivate, drive tractors and perform other tasks now listed as hazardous. As a result, vocational agriculture teachers received many requests from farmers for some type of assistance with these problems.

On October 1, 1969, a proposal was published in the Federal Register to revise the child labor regulations, orders and statements of interpretation on those occupations considered hazardous in agriculture. The revised order was published January 1, 1970, and became effective in January, 1970.[1]

Certain exceptions were written into the basic order along with a procedure for applying for exclusions. The order does not apply to youth working for their parents or legal guardian on the home farm (Section 1500, 70b). Sections 1 - 6 do not apply to student learners placed in occupational experience programs, subject to the conditions listed (Section 1500, 72a) in the order.

An exclusion from Sections 1 and 2 can now be attained for youth of 14 and 15, provided their vocational agriculture teacher has signed an exemption certificate indicating that the student has successfully completed the approved training programs. A youth with a valid exemption certificate[2] may be legally employed in those hazardous occupations listed on his certificate. The training programs contained in this publication may be used to qualify for an exemption certificate.

The exemptions that can be obtained by the successful completion of these training programs apply to the following sections of the order listing hazardous occupations in agriculture.

1. Operating a tractor of over 20 PTO horsepower, or connecting or disconnecting an implement or any of its parts to or from such a tractor.

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[1] The complete revised order is found in Appendix 1.

[2] A copy of an exemption certificate can be found in Appendix 2.

2. Operating or assisting to operate (including starting, stopping, adjusting, feeding or any other activity involving physical contact associated with the operation) any of the following machines:

   (i) Corn picker, cotton picker, grain combine, hay mower, forage harvester, hay baler, potato digger or mobile pea viner;

   (ii) Feed grinder, crop dryer, forage blower, auger conveyor or the unloading mechanism of a nongravity-type self-unloading wagon or trailer; or

   (iii) Power posthole digger, power post driver or nonwalking-type rotary tiller.

Using the Training Programs

There are two training programs, one for safe tractor operation and one for safe farm machinery operation. The student must complete the tractor program before taking the farm machinery program. These programs attempt to incorporate enough flexibility to be usable in the various regions of the country.

Requirements

The tractor program requires a minimum of 15 hours of instruction. Twenty-five hours of instruction are considered desirable, and additional time may be used if the teacher considers it necessary for his particular class. At least 12 of the required 15 hours must be classroom instruction. The emphasis of the program is safety, and quality instruction is a requirement. The teaching of all items marked (E) in the outline is required.

References

References listed in the programs are intended to be a guide. The list is not inclusive of all good references, nor is it intended to exlude any. Note that some of those listed are out of print, e.g. the John Deere farm machinery book. However, it was included because many teachers still have copies of it and the safety information is still valid. You may have your own favorite references which are not on this list. If they do the job, use them.

Tests

Two types of tests are required, one operational and one written.

The written test will contain at least 50 questions. Some states have both written and operational tests as a part of a state safety program or contest. Several are similar to the ones presented here and may be used. The important point is that the student must pass both tests before issuance of the exemption certificate, and the teacher must be convinced of the student's ability to operate equipment safely. Students must pass the written test before being allowed to take the practical test.

Records

The teacher must keep a record of the date, hours of instruction given, students present at each instructional period and the score sheets of the students' tests. The score sheets should be kept on file until the student's 16th birthday.

Teachers can obtain exemption certificates from their state supervisor of agricultural education. When certificates are issued, it is necessary to record the certificate number and to whom it is issued. It is also necessary to record any injuries that might occur to any student to whom a certificate has been issued.

It should be pointed out that these training programs do not replace the student learner exclusion. The student learner exclusion applies to Sections 1 - 6. The programs given here only apply to Sections 1 and 2 of the order. The intent is to provide systematic high quality instruction in safety. It is possible to issue a certificate for tractor operation only if the student passed the tractor program but not the farm machinery program. However, it is recommended that a student not be issued a certificate unless he has passed both programs. If the teacher has any doubts or reservations about the student's ability to operate equipment safely, he should not issue the certificate. It is not mandatory to issue certificates to all students who pass the course.

Employer's Responsibility

1. Keep on file a copy of the certificate verifying that the youth has been trained.
2. Instruct the youth on the safe and proper operation of the tractor or implement.
3. Check on the welfare of the youth during the day to insure that he is following required safety practices.
4. Report any accident that leads to injury that may occur to a youngster working under the provisions of this training certificate.

Teacher's Responsibility

1. Provide quality safety instruction to students.
2. Test the student to determine whether or not the individual understands proper safety procedures.
3. Keep on file a copy of the certificate verifying that the youth has been trained.
4. Keep a record of any accident resulting in an injury to any student working under the provisions of this training certificate.

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VOCATIONAL AGRICULTURE TRAINING PROGRAM IN SAFE TRACTOR OPERATION

Agriculture has long been considered a hazardous occupation. The expanded use of agricultural machinery makes it imperative that young workers have a maximum amount of training in the safe and proper use of farm tractors before being employed as tractor operators.

The majority of tractor accidents can be traced to a lack of judgment, foresight, skill, alertness or knowledge on the part of the operator. This program seeks to overcome these problems by exposing the student, under supervision, to the principles of safe tractor operation. Special emphasis will be placed on safety procedures and skill development in various phases of tractor operation. This is a basic course in tractor operation. The successful completion of the course would qualify 14- and 15-year-old vocational agriculture students to perform basic tractor operations in a practical and safe manner.

The purposes of this program are to:

(1) Develop the skills needed for safe tractor operation.

(2) Develop understanding of the principles of safe tractor operation.

This program requires a minimum of 15 hours of instruction. Additional time may be needed, depending upon the experience and ability level of the students in any given class. The need for more than 15 hours of instruction will be determined by the instructor. Of these 15 hours, at least 12 should be organized classroom instruction. The time spent in actual operation of a tractor should be based on the teacher's judgment of the needs of individual students. It may require less time for more experienced students and more time for less experienced students.

At the conclusion of the course, the students must successfully pass a written examination to indicate that they are thoroughly familiar with operational and safety procedures involved in tractor operation. The students will also be required to demonstrate through an operational test that they can operate a tractor in a safe and practical manner.

Only after the student has completed the 15 or more hours of instruction and passed both the written and practical tests of safe tractor operation, shall he be considered competent to perform basic farm tasks with the tractor, and be eligible to receive a certificate to that effect.

The instructor will be a qualified vocational agriculture teacher experienced in tractor operation. He should be aware of the inherent dangers of tractor operation and safety counter measures. All aspects of the training will be under his direction. It is recommended that provisions be made for follow-up supervision of the students after they complete the course.

While this program is directed primarily toward safe tractor operation, it is recognized that safety is also related to tractor maintenance. The teacher should include those elements of tractor maintenance which he believes are necessary and consistent with the knowledge and ability level of his students.

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Since teachers for this course are trained professionals, it is presumptive to dictate methods of teaching. However, it is suggested that the following steps be included for each operation: 1) Explanation of the importance of the step; 2) Demonstration of proper performance; 3) Supervision of student performance of the step; and 4) Correction of student errors. Emphasis should be given to the various hazards with an explanation of the relationship of the hazard to the steps taken to avoid or reduce the hazard. Teaching techniques and suggested demonstrations are listed in the references.

Instructional equipment needed will include one or more tractors of the types prevalent in the community, operating manuals for these tractors, chalkboards, reference materials, timing watches, student notebooks and pencils. Other audiovisual equipment such as films, filmstrips and overhead projectors are desirable. Materials needed for various demonstrations are listed in the references.

Basic References

1. Manufacturers' operator's manuals.

2. State Vehicle Operator's Manual or appropriate regulations.

3. Tractor Operation and Daily Care, American Association for Vocational Instructional Materials, Athens, Georgia, June 1970.

4. Tractor Overturn Prevention and Protection, National Safety Council, Chicago, Illinois.

5. 4-H Manuals Numbers 1, 2 and 3, Tractor Care and Safety Program, Cooperative Extension Service.

6. Tractors, Fundamentals of Machine Operation series, John Deere Service Publications, Department F, John Deere Road, Moline, Illinois 61265. A 160-page illustrated manual with slides.

Supplemental References

1. Farm Tractors, Engineering Bulletin FT-535, Standard Oil Division, American Oil Company, February 1968.

2. Gulf Farm Tractor Guide, Gulf Oil Corporation, Marketing Technical Division, Houston, Texas.

3. Farm Tractor Maintenance, Brown and Morrison, Interstate Printers and Publishers, Danville, Illinois, 1962.

4. The Operation, Care and Repair of Farm Machinery, (28th edition), Deere and Company, Moline, Illinois, 1957 (out of print).

5. Operating Farm Tractors and Machinery, Iowa State University, Ames, Iowa, 1969.

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6. Farm Safety Review, National Safety Council, Chicago, Illinois.

7. Leader's Manual and Demonstration Guide, 4-H Tractor Program, National 4-H Service Committee, Inc., Chicago, Illinois, 1963. (Can probably be secured from your 4-H extension agent.)

8. Fundamentals of Service Series, John Deere Service Publications, John Deere Road, Moline, Illinois 61265.

9. Preventive Maintenance, Fundamentals of Machine Operation series, John Deere Service Publications, Department F, John Deere Road, Moline, Illinois 61265. A 170-page illustrated manual with slides.

10. Play It Safe, Ford Tractor Operations, Ford Motor Company, 2500 East Maple Road, Birmingham, Michigan 48012. A kit containing a filmstrip with 79 frames of tractor safety ideas, a script, two wall charts, 100 stick-on tractor safety decals and 100 "Play It Safe" brochures for students.

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INSTRUCTIONAL PROGRAM OUTLINE

This instructional outline is intended to be used as a guide, and may be expanded to meet the needs of individual situations. Also included are source units that may be used as an aid by busy teachers in preparing to teach units of the training program. A minimum of 15 hours of instruction is required. However, 25 hours is considered desirable, including the students' supervised operating experience. Instruction must be provided in those topical areas followed by (E).

Topical Outline

I. (E) Understanding the Importance of Tractor Safety

- A. Understanding agriculture as a hazardous occupational area
- B. Determining the role of tractors in accidents
- C. Human factors -- why people don't observe safe practices
- D. Differences in tractors

II. Understanding Pre-Operating Procedures

- A. Checking crankcase oil level
- B. Checking cooling system
- C. Checking lubricant levels
- D. Removing water and sediment from fuels
- E. Servicing air cleaner
- F. Checking clothing and miscellaneous items

III. Making Adjustments to Meet Operating Needs -- Principles

- A. Understanding principles and effect of rear wheel spacing
- B. Understanding principles and effect of front wheel spacing
- C. Understanding principles and effect of adding weights
- D. Understanding controls -- principles, placement and use

IV. Starting and Stopping the Tractor Engine

- A. Adjusting seat position
- B. Operating only in ventilated area
- C. Operating with gearshift lever in neutral or lock position
- D. Using throttle and choke
- E. Understanding proper use of crank or tows to start engine
- F. Using clutch and brakes
- G. Starting practices for warm and cold engines
- H. Using shut-off control

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V. (E) Controlling Movement

A. Understanding tractor controls and how they operate
B. Clearing area of obstructions
C. Starting movement
D. Reducing speed when approaching a turn
E. Using the clutch properly
F. Shifting gears
G. Reversing
H. Stopping movement

VI. (E) Hitching to Tractor-Operated Equipment

A. Adjusting drawbar height
B. Positioning of tractor during hitching
C. Attaching equipment to drawbar
D. Hitching rear-mounted equipment
E. Understanding PTO standards and usage
F. Connecting hydraulic cylinder hoses
G. Using safety shields for PTO shafts
H. Attaching belt-driven equipment
I. Wearing proper clothing

VII. (E) Operating Under Field Conditions

A. Adjusting before beginning work
B. Checking instrument panel
C. Selecting gears, engine speed and load
D. Overloading
E. Operating on slopes
F. Getting out of mud hole or ditch
G. Understanding hazard of other riders
H. Making short turns
I. Understanding tires and tire slippage
J. Dismounting

VIII. (E) Operating Under Highway Conditions

A. Understanding safety warning devices
B. Using safe speeds
C. Using the right-of-way privilege
D. Turning at road speed
E. Slowing and stopping from road speeds with and without trailing equipment
F. Towing a farm tractor
G. Entering and leaving main roads
H. Understanding applicable local laws

IX. Unhitching Equipment

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X. Refueling

A. Understanding gasoline
B. Understanding diesel fuels
C. Understanding L.P. gas

Source Units

I. UNDERSTANDING THE IMPORTANCE OF TRACTOR SAFETY

A. Content outline

1. Understanding agriculture as a hazardous occupational area
2. Determining the role of tractors in accidents
3. Understanding human factors -- why people don't observe safe practices
4. Differences in tractors

B. Anticipated problems, questions and concerns of students

1. How extensive are fatal and disabling accidents involving tractors on farms in the U.S.?
2. What is the most common cause of death in tractor accidents?
3. What are some steps that can be taken to lower tractor overturn accident rates?
4. What are some of the safety improvements on modern tractors?
5. What are some human traits that contribute to accidents?
6. What are some favorable factors for safe job performance?
7. How can lack of skill contribute to an accident?
8. How can individual motivation lead to an accident?
9. What are some of the adverse environmental factors that a tractor operator must be alert to in order to operate a tractor safely?
10. What are some defenses or safety actions that a tractor operator must know in order to avoid accidents?
11. What relationship does tractor speed have to accidents?
12. How should turns be safely negotiated?
13. What are some safe practices to follow when driving near ditches?
14. How can poor ground or weather conditions contribute to accidents?
15. What are some surface hazards that should be avoided? How?
16. What are some of the dangers of driving a tractor on public roads?
17. How should a tractor be driven on public roads?
18. What are some of the dangers of heavy loads?
19. Why should all loads be pulled only by the tractor drawbar?
20. What activities raise the likelihood of an accident while traveling downhill?
21. How can you prevent accidents while going downhill?
22. What activities raise the likelihood of an accident while traveling uphill?
23. How can you prevent accidents while going uphill?
24. How should a tractor be operated on a slope?
25. How many people should ride on a tractor? Why?
26. Why are physical and mental fitness necessary for safe tractor operation?
27. How can proper tractor maintenance help decrease the likelihood of an accident?

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C. Suggested activities

1. Show a film on safe tractor operation.
2. Have students participate in the FFA Tractor Safety Program.
3. Have a panel of individuals who have had tractor accidents discuss them with the class.
4. Have students list unsafe tractor practices observed on their farms or on neighboring farms.
5. Demonstrate safe tractor operation.

D. References

1. Tractor Overturn Prevention and Protection, pages 2-20.

II. UNDERSTANDING PRE-OPERATING PROCEDURES AND THEIR IMPORTANCE FOR EFFICIENT OPERATION AND TRACTOR LIFE

A. Content outline

1. Understanding the relationship of daily care to efficient operation and tractor life
2. Determining procedures required in pre-operational preventive maintenance
3. Developing the skills required to perform daily pre-operational preventive maintenance

B. Anticipated problems, questions and concerns of students

1. What is a tractor operator, and how does he differ from a tractor driver?
2. Why is a study of daily pre-operational activity needed?
3. What activities should a tractor operator perform as pre-operational preventive maintenance?
4. Why is daily servicing required?
5. What does the air cleaner do, and how does it affect engine operation?
6. What types of air cleaners are used?
7. Why is a pre-filter, or dust cap, used ahead of the air filter?
8. What steps are required in servicing an oil bath air cleaner?
9. What steps are required in servicing a dry (paper filter) air cleaner?
10. What affects the frequency and timing of air cleaner servicing?
11. How often should each type of air cleaner be serviced?
12. What trouble-shooting searches are needed to avoid trouble?
13. What other air cleaners are found in addition to the carburetor air intake air cleaner?
14. What types of such units are used on tractors, and what service practices are required for each type?
15. What types of oil are required for oil bath air cleaners, and why is it important that the proper oil type is used for servicing them?
16. What other precautions should be considered in servicing air cleaners?
17. What are the jobs of oil in the engine?
18. What happens when oil overheats?
19. What position should the tractor be in when the oil level is being checked?

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20. What methods do different tractor manufacturers use in providing a way to check the oil level?
21. What are the steps in checking the oil level using a dipstick and for pet-cock type oil-checking equipment?
22. When should oil be changed?
23. What precautions should be taken when adding or changing oil?
24. What happens to an internal combustion engine which is run without proper coolant in the cooling system?
25. Why does even a minute or two of running without coolant damage the engine?
26. What are the two major types of cooling systems found on most engines?
27. Liquid coolant types of engines have two circulation principles. How do they differ?
28. Why is a pressure cap required on forced circulation systems?
29. What is the purpose of the vacuum valve in the pressure cap?
30. What normal daily pre-starting check procedures should be used for the cooling system?
31. How should the level of coolant be determined for a specific engine?
32. Why is coolant level in the system important?
33. What types of coolants should be used?
34. How and when should coolant be replaced?
35. Which parts of the tractor require daily (10 hour) lubrication, and how are they determined?
36. What are common lubricants for various parts of the tractor and related equipment?
37. What are the steps required for greasing fittings with grease guns?
38. What are the recommendations for the transmission, hydraulic system, and other lubrication applications for your specific tractor model? Where are these located?
39. What contaminants are most likely to cause fuel trouble?
40. Why is water more troublesome in diesel fuel than in gasoline?
41. How can water be removed from fuel in the tractor fuel system?
42. Why are daily checks for fuel line leaks essential?
43. What precautions should be taken prior to starting the engine relative to clothing, shoes, tractor platform, etc., from a safety standpoint?
44. How should the operator approach the routine of daily checking for loose nuts, worn parts, tire condition, adjustment of parts, etc.?
45. What is "preventive maintenance"?
46. Why develop a daily checklist for routine inspection of tractors?

C. Suggested activities

1. Demonstrate a typical daily pre-service inspection procedure.
2. Using damaged parts from poorly serviced equipment, demonstrate the types of damage that clogged radiators, lack of grease, oil or coolant can result in.
3. Using current labor charges, parts costs, etc., have the group calculate the cost of failure to service the air cleaner and check the coolant daily.
4. "Fix" a tractor with numerous defects or faults that should be detected by a routine daily maintenance check, and have the group identify the problems and correct (or explain how to correct) each problem.

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D. References

1. Tractor Operation and Daily Care, pages 3-16.
2. 4-H Manual No. 1, Tractor Care and Safety Program, pages 43-66.

III. PRE-OPERATION ADJUSTMENTS TO MEET OPERATING NEEDS

A. Content outline

1. Adjusting seat position and tension
2. Changing rear wheel spacing
3. Changing front wheel spacing
4. Adding weight for traction and balance
5. Adjusting tire pressures to weight changes and surface conditions

B. Anticipated problems, questions and concerns of students

1. What influences the seat adjustments considered most desirable for tractor operation?
2. Why is proper seat adjustment important?
3. How can the seats of the tractors used for instructional purposes be adjusted? Where can instructions for these adjustments be located?
4. What is considered the ideal seat position for tractor operation?
5. Why is it necessary to change tractor wheel spacing?
6. Why should the tractor be on a level surface when spacing wheels?
7. Where should you place the jack when jacking up the rear wheels?
8. What two major systems are used to alter rear wheel spacing for tractors?
9. Which system is used on the tractor used for demonstration purposes?
10. What steps are required for adjusting the rear wheel spacing on the demonstration tractor?
11. What are the limits of spacing on the tractor used for instruction?
12. What three types of front end suspension are used on farm tractors?
13. What methods of adjusting dual front end wheel spacing are used?
14. What precautions should be taken when front wheel spacing is altered?
15. What steps should you follow in adjusting wheel spacing on adjustable axle-type suspensions?
16. When is extra weight needed on the rear wheels? Front wheels?
17. How is weight normally added to the rear wheels?
18. How is weight normally added to the front wheels?
19. When are uneven weights needed on different sides of the tractor?
20. Under what conditions should pressure in tires be below or above the normal recommended pressure?
21. What are the steps in checking and adjusting air pressure in tires when liquid is included in the tires for added weight?
22. Why should tire pressure gauges be washed carefully after checking tires with calcium chloride solution in them?
23. How should suitable tire pressure be determined for various conditions?

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C. Suggested activities

1. Use operator's manuals (or overhead projector transparencies made from them) to point out differences in various tractors.
2. Using a tractor, demonstrate procedures to follow in making adjustments, stressing safety.
3. Have students observe or work on at least one type of tractor, other than the one used in demonstrations, for comparison.

D. References

1. Tractor Operation and Daily Care, pages 18-37.

IV. STARTING AND STOPPING THE TRACTOR ENGINE

A. Content outline

1. Identifying engine types
   a. Determining identifying features
   b. Determining differences in starting, operating and stopping principles
2. Understanding preliminary starting preparations
3. Starting engine operation
4. Making adjustments during warm-up and operation
5. Starting and storing

B. Anticipated problems, questions and concerns of students

1. How can you tell by looking at an engine what type of fuel it uses?
2. What are the four strokes in sequence during one cycle of a four-stroke engine?
3. How do two-stroke cycle gasoline and diesel engines differ from four-stroke engines?
4. How does the operator's manual indicate that a specific tractor should be started?
5. What preliminary safety precautions should be followed in starting the engine on any tractor?
6. What are the differences between starting procedures for gasoline, L.P. and diesel engines?
7. What is the difference between the tractor throttle and an automobile accelerator?
8. Why is it desirable to disengage the clutch while starting an engine?
9. Why should the gearshift lever (speed selector) be in neutral while starting the engine?
10. What purpose does the choke have?
11. If the engine doesn't start on the first try, why is it important not to try again until the engine movement stops?
12. What are the most common reasons for an engine's failure to start?
13. What trouble-shooting procedure is suggested in the event that an engine fails to start?

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14. Why should an engine run at a fast idle while warming up?
15. What adjustments are usually made while the tractor engine is running?
16. How are each of the following types of engines stopped to avoid damage?
    a. Gasoline
    b. L.P.
    c. Diesel
17. Why should the vertical exhaust pipe be covered while stored outdoors?
18. If stored longer than a few days, how should a tractor be prepared for storage?
19. What specific safety precautions are required when starting, running and stopping tractor engines?

C. Suggested activities

1. Demonstrate proper starting, warm-up, running and stopping practices.
2. Use damaged parts to illustrate damage due to improper warm-up and/or stopping of a hot engine.
3. Demonstrate storage practices.
4. Test at the end of the unit.

D. References

1. Tractor Operation and Daily Care, pages 38-50, 108-109.
2. 4-H Manual No. 2, Tractor Care and Safety Program, pages 13-18, 31-32, 37-38, 49-50.

V. CONTROLLING MOVEMENT

A. Content outline

1. Identifying the type of tractor transmission
2. Starting tractor movement
3. Operating a tractor while in motion
4. Stopping tractor movement

B. Anticipated problems, questions and concerns of students

1. Why is it important to know about tractor transmissions and how they work?
2. What is a transmission?
3. What types of transmissions are available on tractors?
4. How does a hand-shift transmission operate?
5. Why is it impossible to shift gears on-the-go with a hand-shift transmission?
6. How does a power-assist shift transmission operate?
7. What are the advantages of a power-assist shift transmission over a hand-shift transmission?
8. What steps should be taken to start tractor movement?
9. How many people, in addition to the driver, can safely ride on a tractor?
10. Why is it important to engage the clutch slowly when starting?
11. How can individual wheel brakes assist a tractor operator in making turns?
12. Why should you keep your speed down when making turns?

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13. Why is it important to adjust brakes so they have an equal amount of pedal travel?
14. After the clutch is engaged, why is it important to completely remove your foot from it?
15. Why should you leave the tractor in gear when going down a hill?
16. What steps should be taken to stop tractor movement?

C. Suggested activities

1. Demonstrate the operation of both a hand-shift transmission and a power-assist transmission.
2. Have each student start, run and stop a tractor with a hand-shift transmission and a tractor with a power-assist transmission.
3. Demonstrate and have students make turns using individual wheel brakes.
4. Demonstrate and have students change gears.
5. Demonstrate the braking action of gears while going down a hill.

D. References

1. Tractor Operation and Daily Care, pages 51-59.

VI. HITCHING TO TRACTOR-OPERATED EQUIPMENT

A. Content outline

1. Attaching equipment to the drawbar
2. Hitching rear-mounted equipment
3. Connecting the power takeoff
4. Connecting the remote (hydraulic) cylinder
5. Hitching to belt-driven equipment

B. Anticipated problems, questions and concerns of students

1. Why is it important that any towed equipment be attached to the drawbar?
2. What are the types of tractor drawbars?
3. How high should the drawbar be adjusted? Why?
4. What are stay bars? Why are they important?
5. What are the methods of changing drawbar height?
6. When do you use a close hitch drawbar?
7. When do you use an extended hitch drawbar? Why?
8. What should the lateral position of the drawbar be?
9. When attaching implements, why not adjust the position of the tractor by operating transmission controls from the ground?
10. What are some safe ways of attaching implements?
11. If you plan to drive on the highway at night, what warning devices should be on the implement you are pulling?
12. What are integral hitches?
13. What are the types of integral hitches?
14. What are the procedures for hitching machines that have integral hitches?
15. What are stablilizer bars?
16. What is PTO?
17. What are the types of PTOs?

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18. What is the difference between a 21-spline PTO shaft and a six-spline PTO shaft?
19. What are the ways in which two speeds for rear power takeoffs are provided? How do they differ?
20. What are the three types of power takeoff drivers? How do they differ?
21. What is the procedure for attaching a rear-mounted PTO?
22. What is a remote hydraulic cylinder? Where is it used?
23. What are the types of remote cylinders?
24. What are the procedures to use for connecting a remote cylinder?
25. How can you determine whether a cylinder is single-acting or double-acting?
26. What are the procedures for attaching belt-operated machinery?
27. Why should the driven machine be securely anchored to the ground?
28. Why wait for the tractor pulley to stop rotating before attempting to attach the belt?
29. Why ground the frame of a rubber-tired tractor?

C. Suggested activities

1. Demonstrate and have each student attach a drawbar-drawn implement to a tractor.
2. Visit farm machinery dealerships to examine the different types of hitches.
3. Demonstrate and have each student attach the PTO to an implement.
4. Demonstrate and have each student attach a remote hydraulic cylinder to a tractor.
5. Demonstrate and have each student attach a belt-driven implement.

D. References

1. Tractor Operation and Daily Care, pages 59-82.

VII. OPERATING UNDER FIELD CONDITIONS

A. Content outline

1. Making adjustments before starting field work
2. Matching gear selection and engine speed
3. Handling overloads with tractor
4. Checking tire slippage
5. Pulling out of a mud hole or ditch

B. Anticipated problems, questions and concerns of students

1. If you are operating the tractor without PTO, what precautions should be taken?
2. If you are operating the tractor with PTO, what procedures should be followed?
3. What procedures should be followed when operating the hydraulic system?
4. What is the difference between limit control and proportioning control types of hydraulic systems?
5. What is automatic draft control?
6. How do you determine which gear to use when operating a tractor?

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7. Why is it safer to operate in a gear that will allow full throttle than a higher gear when pulling heavy loads?
8. What is a good test of whether you are pulling a reasonable load?
9. How can you determine proper engine speed?
10. How have tractors been equipped to adjust to overloads without stopping the tractor?
11. What are planetary units? Double clutch units? Torque converter units?
12. Why is tire slippage important?
13. What is excessive tire slippage?
14. How can you check tire slippage?
15. How can you reduce tire slippage?
16. Why is it dangerous to attempt to reduce tire slippage by lowering the pressure in both rear tires?
17. What can you do to reduce the chance of tipping sideways when driving your tractor around slopes?
18. What safety procedures should be used when pulling a load uphill?
19. What safety procedures should be followed when going downhill?
20. How close should you drive to the edge of ditch banks?
21. What should not be done when moving a tractor that is mired in a mud hole or lodged in a ditch? What should be done?
22. What precautions should be taken when dismounting from a tractor?
23. Is it a safe practice to ride on the drawbar of a tractor?
24. What precautions should be taken when making short turns?
25. What should be done if your engine develops a knock?
26. How do you read an oil pressure indicator?
27. Why is it important to read the temperature gauge on a tractor?
28. What does the thermometer indicator light tell a tractor operator?

C. Suggested activities

1. Have students identify areas on the tractor and implements that should have shields.
2. Demonstrate the full throttle operation of a tractor.
3. Have students determine proper engine speeds for different loads.
4. Examine tractor tires for indications of excessive slippage.
5. Demonstrate and have each student go through the procedure for correctly mounting and dismounting a tractor.
6. Make a panel of tractor instruments and present different instrument readings for students to analyze and correct.

D. References

1. Tractor Operation and Daily Care, pages 83-100.

VIII. OPERATING A TRACTOR UNDER HIGHWAY CONDITIONS

A. Content outline

1. Providing safety warning devices
2. Selecting a safe speed
3. Using right-of-way
4. Slowing or stopping a tractor at road speeds
5. Towing a farm tractor

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B. Anticipated problems, questions and concerns of students

1. Why must slow moving vehicles be marked as slow moving vehicles?
2. What does the standard slow moving vehicle emblem look like?
3. What lights should be used on a tractor for night use or limited vision conditions?
4. What gear is generally most appropriate for highway travel? Why?
5. When should you drive on the shoulder of a road?
6. When should you drive on the pavement of a highway?
7. What should you do if traffic begins to build up behind you on the highway?
8. What should you do when preparing to stop your tractor at highway speeds?
9. What precautions should you follow when towing a farm tractor?
10. Why should a tractor be towed at low speeds?
11. What are the state laws that pertain to tractor operation on highways?
12. How should you enter a highway from a lane or side road?
13. What precautions must be taken when turning at highway speeds?
14. What procedures should you follow if you have a breakdown or accident on the highway?

C. Suggested activities

1. Demonstrate the correct operation of lights on tractors and implements.
2. Have the local police explain highway laws that pertain to tractor operation.
3. Have each student list safe and unsafe procedures in driving tractors on highways.

D. References

1. Tractor Operation and Daily Care, pages 101-106.

IX. UNHITCHING EQUIPMENT AND STOPPING THE TRACTOR ENGINE

A. Content outline

1. Unhitching farm equipment
2. Stopping a carburetor engine
3. Stopping a diesel engine

B. Anticipated problems, questions and concerns of students

1. What procedures should be followed in disconnecting farm equipment?
2. Why must you be sure to cap the ends of hose couplings?
3. What should be done when you disconnect the PTO?
4. What procedures should be followed in stopping a gasoline engine?
5. Why don't you choke the engine to stop it?
6. Why cover the vertical exhaust pipe if the tractor is left outdoors?
7. What procedures should you follow in stopping an L.P. gas engine?
8. What procedures should you follow in stopping a diesel engine?

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C. Suggested activities

1. Demonstrate and have each member of the class stop a gasoline tractor, an L.P. tractor and a diesel tractor.
2. Demonstrate and have students unhitch PTO, hydraulic cylinder and implements from a tractor.
3. Have students identify areas where safety hoods should be.

D. References

1. Tractor Operation and Daily Care, pages 107-109.

X. REFUELING

A. Content outline

1. Refueling with liquid fuels
2. Refueling with L.P. gas

B. Anticipated problems, questions and concerns of students

1. Why is the time and method of refueling important?
2. Why should you fill the fuel tank at the end of the day or whenever you finish using the tractor?
3. What are the problems of moisture in the gas tank?
4. Why is there a fire hazard when handling fuels?
5. What procedures should be followed when filling a fuel tank with gasoline, kerosene or fuel oil?
6. When filling an L.P. gas tank, why must you be sure to use a vapor return hose line?
7. What procedures should be followed when filling an L.P. gas tank?
8. Why should you never attempt to fuel a tractor inside a building or over a pit?
9. What are the differences between float-type and tube-type fuel gauges on L.P. tractors?
10. What is the purpose of a safety release valve on the gas tank of an L.P. tractor?

C. Suggested activities

1. Prepare a demonstration to show how water will condense in a gas tank.
2. Present samples of approved types of gas cans.
3. Demonstrate and have students go through the process of refueling with liquid fuels and L.P. gas.

D. References

1. Tractor Operation and Daily Care, pages 110-115.

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Important Safety Practices

1. Only one person, the operator, should be permitted on the tractor when it is in operation.

2. Refuel your tractor only when the engine has been cooled off. Do not smoke or use an oil lantern while refueling.

3. Be sure power takeoff shields and guards are in place and in good order before starting field work.

4. Tractor brakes should be adjusted properly.

5. Oil, grease or adjust a farm machine only when the engine has been turned off.

6. Clothing worn by tractor or machine operators should be fairly tight and belted. Loose clothing (unzipped jackets, loose sleeves, skirts, etc.) should not be permitted because of the danger of snagging on moving parts.

7. Refill the radiator only when the engine is stopped or idling slowly. To avoid being scalded when the radiator cap is removed, first turn cap slightly to the stop to allow steam to escape through the overflow pipe. After all pressure is relieved, remove the cap.

8. Never run the engine or operate your tractor in a closed garage or machine shed.

9. Drive slowly when traveling with heavy integral tools mounted on the rear of the tractor.

10. Never drive a tractor too close to the edge of a ditch or creek.

11. When your tractor is hitched to any drawn load, always hitch to the drawbar and never take up the slack in a chain with a jerk.

12. Always keep your tractor in gear when going down steep grades.

13. Drive at speeds slow enough to insure your safety. Reduce speed before turning quickly or applying individual brakes. Drive slowly over rough ground.

14. Keep a firm grip on the steering wheel at all times when the speed is increased.

15. No one should stand between a moving tractor and an implement during the hitching process.

16. You can make your farm a safer place to live and work if you observe the safety suggestions given in the manufacturers' operator's manuals.

17. Use "Slow Moving Vehicle" emblems and blinker lights on tractors and equipment when on the public road. Keep the emblems clean and bright.

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Testing Procedures

I. Written Test

The written test should consist of a minimum of 50 objective questions. Questions used will be chosen by the teacher, and will be consistent with safe tractor operation and based upon the instruction given. If repeat exams are given, a different test should be developed.

The questions should be of a discriminatory nature, involving realistic choices for the proper responses. Some examples of discriminatory questions are:

It is important from a safety standpoint to have both brake pedals adjusted:

a. for different pressures.
b. so pressure is applied evenly when the pedals are locked together.
c. to personal preference.

True or False: When working hilly or rough ground, the wheels of the tractor should be set as wide as possible.

II. Practical Test

The student must demonstrate his ability to hitch, tow, back and unhitch a two-wheeled farm implement. He must demonstrate sufficient proficiency and observance of safety procedures to indicate, in the opinion of the instructor, that he is qualified to use this type of tractor for simple tasks. The driving must include turning and driving around obstacles. Gates, old tires or a lime marker can be used to lay out a course. A side delivery rake provides a good test of driving skill. A suggested driving course and score sheet has been included in this publication.

The emphasis is on safety. Therefore, this is not a timed event. The student must be allowed time to demonstrate his operating ability. There are at least 20 safety items on which the student is to be graded during the practical test. It is suggested that five points be deducted for each item missed. The instructor should examine the course and determine what is to be a passing score.

Directions for Tractor Operator's Test

1. Students will operate the tractor in a safe manner and at safe speeds at all times. Unsafe operation, at the discretion of the instructor, will disqualify a student. Road gear will not be used in negotiating the two-wheel course layout. The use of steering wheel spinners is not permitted.

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2. The two-wheeled implement to be used will be determined by the local teacher. A two-wheeled trailer with a pin type hitch for quick coupling is recommended. A wooden frame can be mounted on the trailer, if necessary, to make it wider than the widest tractor being used.

3. Markers may be constructed according to the plans attached. Used golf balls may be obtained inexpensively by buying practice balls from any golf driving range.

4. Since the emphasis is upon safe operation, this event is not timed. However, past experience indicates that most students should be able to complete the two-wheel course in six to eight minutes.

Judging and Scoring

Two score sheets are kept on each student. One will be for driving safety. The student will be scored on this sheet at all times he is operating a tractor, including the two-wheel course layout.

The other will be the score sheet for the two-wheel layout given below. This sheet may be used in several ways. The teacher will decide how it best fits his local conditions. The number of times an error is made is recorded. It is suggested that if two or more marks are made for items A or B or three or more against items C, D or E, additional instruction is needed by the student.

The teacher may desire to determine a disqualifying score in terms of penalty points as indicated. Students exceeding this score would be considered as failing the test.

Two-Wheel Course Test

I. Procedure

Two persons will be needed for recording scores, measuring and observing operation.

The student will start and warm up the tractor at the starting line. Student signals instructor that he is ready to begin — engine running, brake set, in neutral. Instructor will give signal to begin.

Drive tractor to implement, stop tractor, dismount and attach implement to tractor drawbar. Student will drive through course layout as shown in the diagram, return implement to the starting line and shut off tractor.

II. Rules

A. No assistance will be allowed in hitching or unhitching. Implement will be on the ground.

B. Whenever dismounting from the tractor, at least one brake must be set. For tractors with automatic transmissions, the selector lever must be in the "park" or "lock" position.

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C. The test begins when the student mounts the tractor to start it. Test ends when the student has dismounted after shutting off the tractor.

D. The instructor may, at his discretion, require the student to change the direction of travel of his equipment when the trailer hitch gets in a cramped position, or when striking a marker, to prevent damage to the trailer or marker.

E. Stakes will be considered "knocked out of line" (see item for score sheet) when the stake is leaning so far that the golf ball will not stay on top when replaced without first straightening the stake. When scoring a stake "knocked out of line", the student will also be assessed a penalty for "golf balls dislodged" (Item A on score sheet).

Tractor Operation Safety Score Sheet

	No. of Times	Penalty Points
1. Golf balls dislodged	_____ x 50	_____
2. Stakes knocked out of line	_____ x 100	_____
3. Tractor engine		
a. Stalled	_____ x 10	_____
b. Grated gears	_____ x 10	_____
4. Travel direction reversed to clear marker or prevent fouling of equipment	_____ x 10	_____
5. Measurement in shed (no fractions)		
a. Inches off center at front	_____ x 10	_____
b. Inches off center at rear	_____ x 10	_____
c. Inches or fractions thereof greater than one inch from rear of shed. Within one inch is perfect. Fractions to be counted as whole inch.	_____ x 10	_____
	Total Penalty Points	_____

The following safety procedure items are to be observed during the practical tractor proficiency test:

Starting Safety

1. Failure to check neutral or "park" position
2. Failure to disengage clutch while starting engine
3. Failure to check PTO for disengagement

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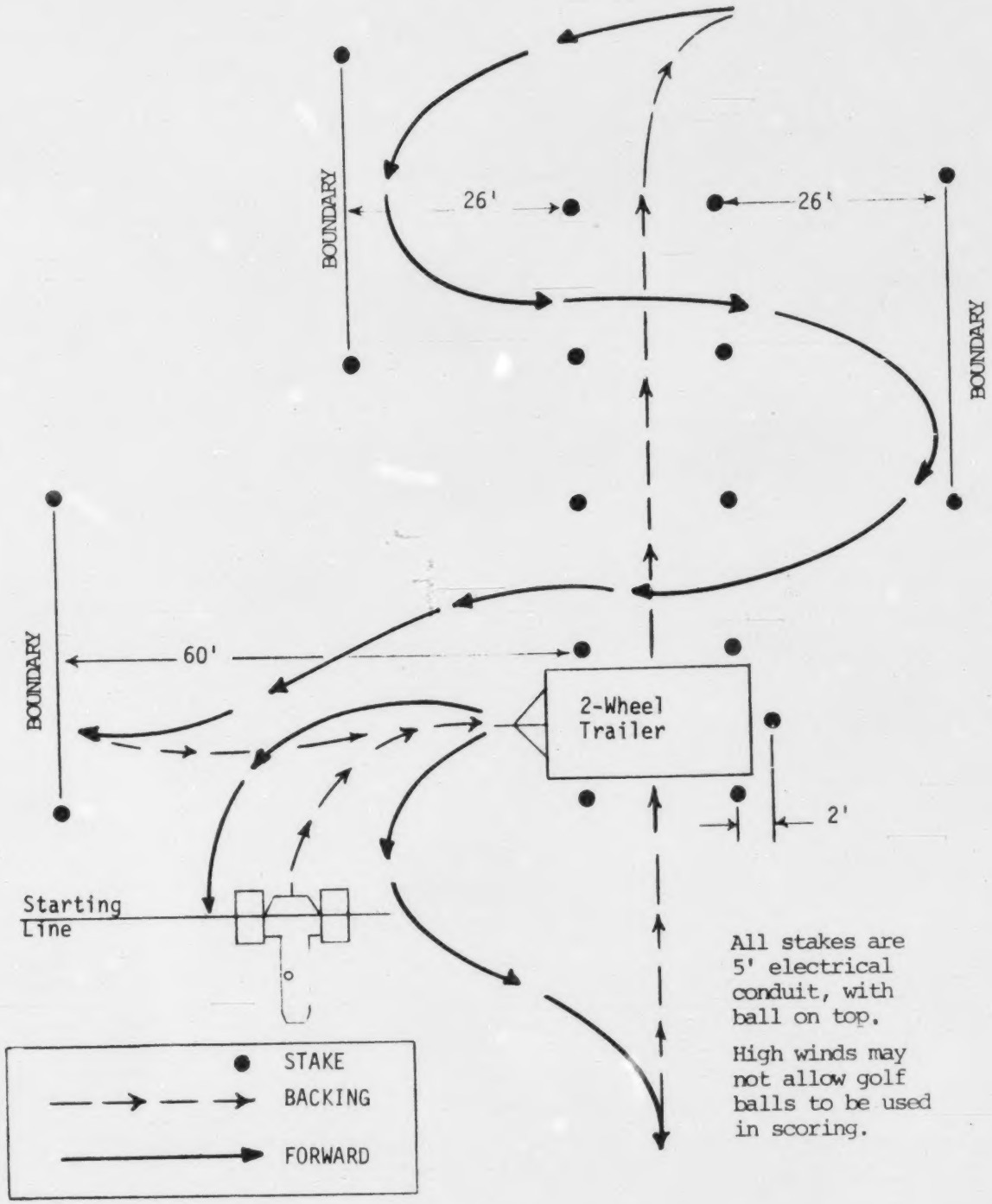
TWO-WHEEL COURSE LAYOUT



All stakes are 5' electrical conduit, with ball on top.

High winds may not allow golf balls to be used in scoring.

ALL STAKE DIMENSIONS - IMPLEMENT WIDTH PLUS 12 INCHES.

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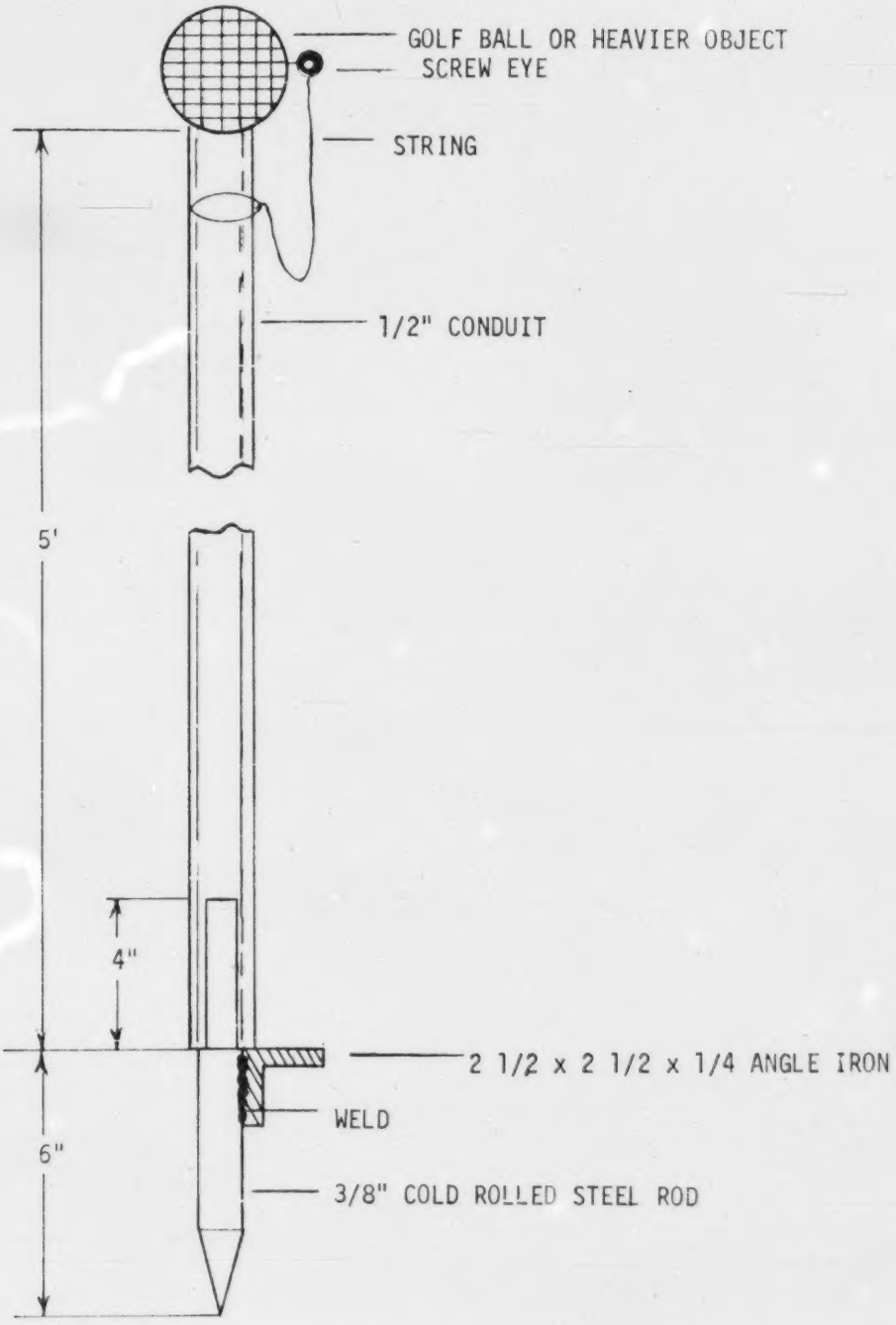
STAKE FOR TRACTOR OPERATOR'S TEST



PROCEDURE:

1. SET STAKE
2. INSERT CONDUIT OVER END OF STAKE
3. PLACE GOLF BALL ON TOP OF CONDUIT, AND TIE

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Driving Safety

1. Failure to engage clutch gently
2. Failure to ride on seat or stand on platform in a safe manner
3. Skidding or spinning of rear wheels
4. Turning too short and fouling equipment
5. Operation of tractor at unsafe speed
6. Moving tractor with brakes set
7. Inadequate precautions with people or objects in the way
8. Driving in such a manner as to be hazardous to equipment or surroundings
9. Any turn which causes inside rear wheel to leave the ground -- automatic failure of test

Mounting and Dismounting Safety

1. Failure to set brake or transmission in "park" before dismounting
2. Failure to check neutral or "park"position of gearshift
3. Jumping on or off tractor
4. Failure to bring tractor to a complete stop before dismounting

Other Safety

1. Smoking
2. Extra rider
3. Loose-fitting clothing
4. Others (list and explain)

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VOCATIONAL AGRICULTURE TRAINING PROGRAM IN SAFE FARM MACHINERY OPERATION

The complexity of modern farm machines has created many problems for the machine operator. Skills and judgment must be developed and practices used which will insure the maximum degree of safety to the operator and the most efficient use of the machine. Errors in judgment, foresight, or lack of attention can cause accidents resulting in loss of time, injury or death.

Training youth to operate farm machinery safely and efficiently requires organized, systematic instruction. It is essential that safety aspects receive special emphasis in all phases of the instruction.

The purposes of this program are to:

1. Provide the knowledge required for safe machinery operation.
2. Develop the skills needed for safe machinery operation.

It must be recognized that the types of machinery used will vary among regions. Local needs will therefore become the basis for the program in any given school. Safe practices for the types of machinery common to that community will be taught and followed.

The course will be taught by a qualified vocational agriculture teacher with experience in machinery operation. He should be one who is aware of the inherent dangers in operating the selected group of machinery, and be particularly safety-conscious.

The methods of teaching will be the prerogative of the individual teacher. He is the most familiar with his students, their ability level and past experiences. It is suggested that the following steps be included for each operation: 1) Explanation of the importance of the step; 2) Tell how and demonstrate proper performance: 3) Supervise student performance and suggest improvements; and 4) Follow up to see that the job is performed correctly. Emphasis should be given to the various hazards with an explanation of the relationship of the hazard to the steps taken to avoid it.

The student must have successfully completed the Vocational Agriculture Training Program in Safe Tractor Operation before enrolling in this program. Both programs must be successfully completed before he may be issued an exemption certificate for machinery operation.

This program will involve a minimum of 10 hours of instruction. Of these 10 hours, the student should receive actual operating experience for a period of time determined by the vocational agriculture instructor. Experienced students may require only one-half hour, while less experienced students may require two to four hours or more. The student must successfully pass a written examination indicating that he is thoroughly familiar with the safety and operational procedures involved in machinery operation. The student will also demonstrate by a practical operational test that he can properly operate farm machinery in a safe manner.

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Only when the student has demonstrated by successfully passing both the written and practical tests of safe farm machinery will the teacher be authorized to award him a certificate to that effect.

Equipment needed for this course includes the various types of machinery and appropriate power sources common to the community. Equipment can usually be obtained from local farms or machinery dealers. Operator's manuals, reference materials, chalkboard and student notebooks and pencils will be required. Additional audio-visual equipment, such as projectors, is desirable.

Basic References

1. Manufacturers' operator's manuals.

2. State Vehicle Operator's Rules and Regulations.

3. Tractor Operation and Daily Care, American Association for Vocational Instructional Materials, Athens, Georgia, June 1970.

4. Tractor Overturn Prevention and Protection, National Safety Council, Chicago, Illinois.

5. 4-H Manual Number 4, Tractor Care and Safety Program, Cooperative Extension Service.

Supplemental References

1. Leader's Manual and Demonstration Guide, 4-H Tractor Program, National 4-H Service Committee, Inc., Chicago, Illinois, 1963. (Can probably be secured from your 4-H extension agent.)

2. Tillage, Fundamentals of Machine Operation series, John Deere Service Publications, Department F, John Deere Road, Moline, Illinois 61265.

3. Planting, Fundamentals of Machine Operation series, John Deere Service Publications, Department F, John Deere Road, Moline, Illinois 61265.

4. Crop Chemicals, Fundamentals of Machine Operation series, John Deere Service Publications, Department F, John Deere Road, Moline, Illinois 61265.

5. Machinery Management, Fundamentals of Machine Operation series, John Deere Service Publications, Department F, John Deere Road, Moline, Illinois 61265.

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Specific Supplemental References

Corn Pickers

1. Corn Pickers and Picking Corn, AGDEX 111/745, 1970, 137 pages. Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Room 201, 2120 Fyffe Road, Columbus, Ohio 43210. A student manual extensively illustrated with pictures, drawings and graphs. The subject matter is divided into the following areas: 1) The value of doing a good job of picking corn: 2) The basic design of the corn picker; 3) Operation of the corn picker; 4) The economics of corn picker ownership; and 5) Safety tips.

Combines

1. Combines and Combining, AGDEX 745, Revised 1970, 105 pages. Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Room 201, 2120 Fyffe Road, Columbus, Ohio 43210. A student manual extensively illustrated with drawings, charts, graphs and pictures. The subject matter is divided into the following areas: 1) The value of doing a good job of combining; 2) The basic design of the combine; 3) Combine operation; and 4) The economics of owning a combine.

2. A Unit Test on Combines and Combining for Students of Vocational Agriculture, AGDEX 100/745. Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Room 201, 2120 Fyffe Road, Columbus, Ohio 43210. Fifty objective questions for use with the publication, Combines and Combining.

3. Combines, Principles of Operation, AGDEX 745, 1965. Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Room 201, 2120 Fyffe Road, Columbus, Ohio 43210. A series of 39 color slides and illustrated script. Designed for use with the manual, Combines and Combining.

4. Efficient Machine Harvesting, AGDEX 745, 1965. Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Room 201, 2120 Fyffe Road, Columbus, Ohio 43210. A series of 21 color slides. No script; the slides are self-explanatory.

5. A Guide to Better Combining, 44 pages. Ford Tractor Operations, Ford Motor Company, 2500 East Maple Road, Birmingham, Michigan 48012.

6. Combines, Fundamentals of Machine Operation series, John Deere Service Publications, Department F, John Deere Road, Moline, Illinois 61265.

Forage Harvesters

1. Hay and Forage Harvesting, Fundamentals of Machine Operation series, John Deere Service Publications, Department F, John Deere Road, Moline, Illinois 61265.

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Hay Mowers

1. Field Mowers, Catalog No. 201, American Association for Vocational Instructional Materials, Engineering Center, Athens, Georgia 30601.

2. Mowers, AGDEX 745, 58 pages. Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Room 201, 2120 Fyffe Road, Columbus, Ohio 43210. A student workbook designed to assist in understanding the principles of cutter bar operation and in applying the knowledge to the operation and repair of the mower. This is used with Field Mowers from AAVIM, listed above.

Balers

1. A Guide to Better Hay Baling, 40 pages. Ford Tractor Operations, Ford Motor Company, 2500 East Maple Road, Birmingham, Michigan 48012.

2. Hay and Forage Harvesting, Fundamentals of Machine Operation series, John Deere Service Publications, Department F, John Deere Road, Moline, Illinois 61265.

Crop Dryers

1. Corn Drying, AGDEX 111/736, 1970. Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Room 201, 2120 Fyffe Road, Columbus, Ohio 43210. A student manual dealing with the following three types of corn drying: 1) Heated forced air; 2) Natural forced air; and 3) Natural drying in storage. Well illustrated.

Materials Handling Equipment

1. Materials Handling, Fundamentals of Machine Operation series, John Deere Service Publications, Department F, John Deere Road, Moline, Illinois 61265.

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INSTRUCTIONAL PROGRAM OUTLINE

This instructional outline is intended to be used as a guide. It is in topical form and may be expanded to meet the needs of individual situations. Also included are source units that may be used as an aid by teachers of agriculture in preparing to teach units of the training program. A minimum of 10 hours of instruction is required. However, more time will generally be required to familiarize students with several types of machinery. Instruction should also be given in the safe and proper means of unclogging power-driven equipment included in Topics III through XVIII. Those topics marked (E) must be taught as a part of the program.

Since there is a wide diversification in the types of equipment to be covered, all students may not spend the same amount of time on all machines. Some machines may not be covered at all. For example, a student in Michigan will have little need to study cotton picker operation. It is suggested that equipment with which the students are likely to be working be selected to study. The machines may be studied by all members of the group or the instruction may be individualized so that individual class members may study those machines they are most likely to use. A note should be made on the training certificate as to the type of machines the student studies during the training period.

Topical Outline

I. (E) Understanding the Importance of Farm Machinery Safety

- A. Understanding agriculture as a hazardous occupational area
- B. Understanding the role of machinery in accidents
- C. Understanding the complexity of machinery
- D. Understanding human factors -- why people don't follow safe practices

II. (E) Understanding Safety Practices Common to All Farm Machinery Operation

- A. Understanding the importance of safety shields
- B. Using proper dress
- C. Understanding safety rules

III. Understanding How to Safely Operate a Corn Picker

- A. Adjusting the corn picker
- B. Operating the corn picker
- C. Maintaining the corn picker
- D. Understanding safety procedures to follow when using the corn picker

IV. Understanding How to Safely Operate a Cotton Harvester

- A. Adjusting the cotton harvester
- B. Operating the cotton harvester
- C. Maintaining the cotton harvester
- D. Understanding safety procedures to follow when using a cotton harvester

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V. Understanding How to Safely Operate a Grain Combine

A. Adjusting the grain combine
B. Operating the grain combine
C. Maintaining the grain combine
D. Understanding safety procedures to follow when using a grain combine

VI. Understanding How to Safely Operate a Forage Harvester

A. Adjusting the forage harvester
B. Operating the forage harvester
C. Maintaining the forage harvester
D. Understanding safety procedures to follow when using a forage harvester

VII. Understanding How to Safely Operate a Hay Mower

A. Adjusting the hay mower
B. Operating the hay mower
C. Maintaining the hay mower
D. Understanding safety procedures to follow when using a hay mower

VIII. Understanding How to Safely Operate a Baler

A. Adjusting the baler
B. Operating the baler
C. Maintaining the baler
D. Understanding safety procedures to follow when using a baler

IX. Understanding How to Safely Operate a Potato Digger

A. Adjusting the potato digger
B. Operating the potato digger
C. Maintaining the potato digger
D. Understanding safety procedures to follow when using a potato digger

X. Understanding How to Safely Operate a Mobile Pea Viner

A. Adjusting the mobile pea viner
B. Operating the mobile pea viner
C. Maintaining the mobile pea viner
D. Understanding safety procedures to follow when using a mobile pea viner

XI. Understanding How to Safely Operate Feed Grinders

A. Adjusting the feed grinder
B. Operating the feed grinder
C. Maintaining the feed grinder
D. Understanding safety procedures to follow when using a feed grinder

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XII. Understanding How to Safely Operate a Crop Dryer

A. Adjusting the crop dryer
B. Operating the crop dryer
C. Maintaining the crop dryer
D. Understanding safety procedures to follow when using a crop dryer

XIII. Understanding How to Safely Operate a Forage Blower

A. Adjusting the forage blower
B. Operating the forage blower
C. Maintaining the forage blower
D. Understanding safety procedures to follow when using a forage blower

XIV. Understanding How to Safely Operate Materials Handling Equipment

A. Adjusting materials handling equipment
B. Operating materials handling equipment
C. Maintaining materials handling equipment
D. Understanding safety procedures to follow when using materials handling equipment

XV. Understanding How to Safely Unload Power Self-Unloading Wagons, Trailers or Manure Spreaders

A. Adjusting the power self-unloading wagon, trailer or manure spreader
B. Operating the power self-unloading wagon, trailer or manure spreader
C. Maintaining the power self-unloading wagon, trailer or manure spreader
D. Understanding safety procedures to follow when using a power self-unloading wagon, trailer or manure spreader

XVI. Understanding How to Safely Operate a Power Posthole Digger

A. Adjusting a power posthole digger
B. Operating a power posthole digger
C. Maintaining a power posthole digger
D. Understanding safety procedures to follow when using a posthole digger

XVII. Understanding How to Safely Operate a Power Post Driver

A. Adjusting a power post driver
B. Operating a power post driver
C. Maintaining a power post driver
D. Understanding safety procedures to follow when using a power post driver

XVIII. Understanding How to Safely Operate a Power Rotary Tiller

A. Adjusting a power rotary tiller
B. Operating a power rotary tiller
C. Maintaining a power rotary tiller
D. Understanding safety procedures to follow when using a power rotary tiller

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XIX. (E) Using Farm Equipment on Highways

A. Understanding highway laws that pertain to farm machinery
B. Driving and pulling farm machinery on highways
C. Understanding the safe use of farm machinery on highways

Source Units

I. UNDERSTANDING THE IMPORTANCE OF FARM MACHINERY SAFETY

A. Content outline

1. Understanding agriculture as a hazardous occupational area
2. Understanding the role of machinery in accidents
3. Understanding the complexity of machinery
4. Understanding human factors -- why people don't follow safe practices

B. Anticipated problems, questions and concerns of students

1. How dangerous is farming as an occupation?
2. What percentage of the farm population is involved in accidents serious enough to cause time loss from the job?
3. What are some of the things that cause accidents?
4. What are some human traits that contribute to accidents?
5. What are some favorable factors for safe job performance?
6. How can lack of skill contribute to an accident?
7. How can individual motivation lead to an accident?
8. Why is physical and mental fitness necessary for safe machine operation?
9. How can proper machine maintenance help decrease the likelihood of an accident?
10. How can fatigue contribute to an accident?
11. What are the major factors contributing to accidents?
12. What percentage of the accidents that occur on farms involve machinery?
13. What age groups have the highest number of accidental deaths on farms?
14. What age groups have the highest number of accidents on farms?
15. What parts of farm machinery should be considered dangerous?

C. Suggested activities

1. Take students on a field trip to a nearby farm to locate dangerous areas.
2. Have each student inventory the dangerous areas on his or a neighbor's farm.
3. Have students develop an FFA farm safety program for the community.
4. Present a radio program on farm safety.
5. Invite a farmer who has had a serious farm accident to discuss his accident with the class.

D. References

1. Tractor Overturn Prevention and Protection, pages 2-5.

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II. UNDERSTANDING SAFETY PRACTICES COMMON TO ALL FARM MACHINERY OPERATION

A. Content outline

1. Understanding the importance of safety shields
2. Using proper dress
3. Understanding safety rules
4. Creating awareness of unshielded moving parts

B. Anticipated problems, questions and concerns of students

1. What are the purposes of safety shields?
2. Where are safety shields needed on machinery?
3. Are shields placed on all dangerous parts of machinery?
4. What are some possible results of not having safety shields properly in place?
5. What kind of clothing should you wear when operating machinery?
6. Why are loose-fitting clothes a hazard when operating machinery?
7. What parts of a machine are most dangerous when exposed to loose-fitting clothing?
8. Which parts of your clothing are most likely to be involved in an accident?
9. What are some desirable safety rules to follow when operating farm machinery?
10. What precautions should be followed when unclogging a machine?
11. When is the best time to read the operator's manual for safety points about each piece of equipment?
12. Why must you know about the rpm of equipment before attaching and using it?
13. Why should engines be shut off before adjusting equipment?
14. How should you act around unshielded moving parts?
15. What should you do when you have an accident or breakdown in the field or on the road?

C. Suggested activities

1. Demonstrate what proper dress should include.
2. Have students inventory farm equipment to determine if all guards are in place.
3. Have students list places on their farm equipment that need guards.
4. Develop with students a list of safety rules that should be followed by machinery operators and distribute to farmers as an FFA project.
5. Demonstrate and have students properly arrange needed guards on farm machinery.

D. References

1. 4-H Manual No. 4, Tractor Care and Safety Program, pages 5-6.

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III. UNDERSTANDING HOW TO SAFELY OPERATE A CORN PICKER

A. Content outline

1. Adjusting the corn picker
2. Operating the corn picker
3. Maintaining the corn picker
4. Understanding safety procedures to follow when using a corn picker

B. Anticipated problems, questions and concerns of students

1. At what PTO speed should your corn picker be operated?
2. How do you select the proper ground speed?
3. Why is it recommended to pick as early in the season as possible?
4. Should the picker travel in the same direction that the field was last cultivated?
5. Why should the operator follow the row so that cornstalks are guided into the gathering throat opening?
6. How do you unclog the snapping or husking rolls on a corn picker?
7. What does the operator do to the corn picking unit when making sharp turns and crossing the end of a field?
8. What maintenance should an operator do to the corn picker unit before putting it into the field for the first time in the fall?
9. Why is it a good idea to shut off the power and stop the engine before leaving the seat?
10. How can an operator estimate the field losses?
11. What type of fire extinguisher should be on your tractor or corn combine?
12. What precautions must be taken during cold weather operation of your corn picker?
13. What is the function of the gathering points and how are they adjusted?
14. How can field stones and rocks cause problems for the operator?
15. How do you adjust a slip clutch on a corn picker?
16. How does the operator adjust chain tension on various chains located on the corn picker?
17. Why is it important for the operator to have the gathering throat openings set correctly?
18. What should the operator know about the snapping rolls on the unit?
19. What do the stripper bars do? Is your unit so equipped?
20. What types of mechanisms on your corn picker need lubrication?
21. How do you mount or attach a corn picker to the tractor?
22. Where would the operator go for suggestions on trouble-shooting?
23. How should you store your corn picker at the end of the day?
24. As an operator, what is the first thing you do before making an adjustment on the corn picker?
25. Why should the operator always pick the rows in matched pairs as they were planted?
26. What precautions should be taken when transporting a pull-type corn picker?
27. How should the stalks look after being picked in relation to their physical attachment in the ground?
28. What are the regulations concerning transportation of corn pickers on public roads?

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C. Important safety practices

(Before Operating)

1. Mount a pressurized fire extinguisher (dry chemical type) on the power unit where it will be handy in an emergency, and check the pressure gauge to see that it is charged.
2. Wear reasonably snug-fitting clothing and never approach moving parts.
3. When refueling the power unit, be sure the tractor engine is cooled off and fuel is away from open flame and persons who are smoking.
4. Keep all safety shields in place and properly secured.
5. Disengage the PTO and stop the tractor engine before making any adjustments, repairs or lubrication. Remove all tools, parts and servicing equipment before engaging the PTO.
6. Keep brakes properly adjusted and in good operating condition.
7. Check the PTO to be sure it is disengaged before starting the tractor.
8. Check to be sure everyone is clear of the machine before engaging the clutch.
9. Set slip clutches so they will function when obstructions are encountered.
10. Use motor screens and exhaust screens when operating in extremely dry conditions.
11. Review the operator's manual.

(During Operation)

12. The operator is the only person allowed on the machine at any time.
13. Keep children away from corn harvesting operations to protect them from hazards.
14. Stop and clean the unit of leaves, stalks or other flammable material near the motor, exhaust or operator's platform.
15. Keep hands and feet away from moving parts.
16. Slow down and stay alert when operating on hillsides or near ditches, gullies or fences.
17. Shut down the power every time you leave the operator's seat.
18. Place support stands under raised snapping units before working around or under the unit. Keep the hydraulic unit in the raised position, but do not rely on it.
19. Mount and dismount the picking unit in a cautious manner.

(After Operating)

20. Clean the machine thoroughly inside and out to remove potential fire hazards.
21. Take necessary precautions to prevent children from accidentally starting the motor.
22. Lock both brakes when the unit is stopped. Wheel blocks should be used also if on a steep hill or slope.
23. Clean off the SMV emblem before transporting the corn harvester on the highway.
24. Store the unit where children will not be tempted to play on it.

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D. Suggested activities

1. Demonstrate the proper adjustment and operation of a corn picker.
2. Have students review available safety material and list any additional causes of accidents with corn pickers.
3. Have students list the causes of local accidents with corn pickers.

IV. UNDERSTANDING HOW TO SAFELY OPERATE A COTTON HARVESTER

A. Content outline

1. Adjusting a cotton picker
2. Operating a cotton picker
3. Maintaining a cotton picker
4. Understanding safety procedures to follow when operating a cotton picker

B. Anticipated problems, questions and concerns of students

1. What things are checked before operation?
2. Why is it important that the operator adjust the seat before operating the cotton harvester?
3. What should the operator know about the use of the brake pedals?
4. How do you park a cotton harvester?
5. If it's necessary to tow the cotton harvester, what procedures should be followed?
6. How do you empty the basket of cotton?
7. How do you start the picking or stripping mechanism on your harvester?
8. In which direction do you travel when harvesting cotton?
9. What safety devices should the operator be aware of on the cotton harvester?
10. What is a good source of trouble-shooting information?
11. What should the operator know about cold weather operation?
12. When and where do you lubricate the harvester?
13. How do you unplug your harvester?
14. How tight should slip clutches be?

C. Important safety practices

(Before Operation)

1. Review the operator's manual.
2. Wear fairly tight clothing.
3. Shut off the engine and extinguish any source of flame when fueling.
4. A compound pressurized dry chemical fire extinguisher should be available on the harvester and checked to make sure that it has a full charge.
5. Make sure everyone is clear before starting the cotton harvester.
6. The operator should be the only person on the cotton harvester.
7. See that all safety shields are in place and properly secured before starting to operate the cotton harvester.

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8. After servicing, be sure that all tools, parts and servicing equipment are removed before starting the cotton harvester.
9. Before working under any hydraulically controlled unit of the cotton harvester, be sure that it is securely blocked.
10. Check the brakes to be sure that they are in good operating condition.

(During Operation)

11. Before starting the engine, be sure that all controls are in neutral.
12. Keep the harvester free of lint and trash to help avoid fires.
13. Use the ladders and steps provided to gain access to the operator's platform.
14. Keep the harvester 8 to 10 feet away from V-banks.
15. Keep hands and feet away from moving parts.
16. Stop the engine before lubricating, cleaning or adjusting the machine.
17. Use caution when removing the pressure radiator cap.
18. Keep the cotton harvester in gear when going downhill.
19. Keep picker platform clean -- this includes keeping guns off the platform.
20. Slow down when making turns at the end of a row.
21. Use a ladder for getting on and off trailers and trucks.
22. Be sure that the picker platform is free of grease or oil.
23. Always lock the brake pedals together before traveling on a roadway or in high gear.
24. Check the height and width clearances carefully before driving the harvester under electrical lines or bridges or into buildings.
25. When moving on the road, use the SMV emblem and warning lights provided with your harvester that comply with the state and local laws governing highway safety.
26. Maintain complete control of the cotton harvester at all times while traveling on the highway.

(After Operation)

27. Block the wheels securely if the cotton harvester is parked on a hillside.

D. Suggested activities

1. Demonstrate the adjustment and operation of a cotton picker.
2. Have students adjust and operate a cotton picker.
3. Have students identify hazardous parts of a cotton picker.

V. UNDERSTANDING HOW TO SAFELY OPERATE A GRAIN COMBINE

A. Content outline

1. Adjusting a grain combine
2. Operating a grain combine
3. Maintaining a grain combine
4. Understanding safety procedures to follow when operating a grain combine

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B. Anticipated problems, questions and concerns of students

1. When the terms "right" and "left" or "front" and "rear" are used, how should you be positioned in relation to the combine to realize which side of the machine or end of the machine is being discussed in the operator's manual?
2. What is the function of a combine cylinder, and how is it adjusted?
3. Should one lubricate a combine or service the combine while it is in motion?
4. When working under the platform or snapping units, what precautions should be taken?
5. Where are the safety shields on your combine located?
6. What kind of a fire extinguisher should be mounted on a self-propelled combine, and where should it be placed?
7. What type of clothing should an operator wear? Why?
8. When refueling the combine, how do you ground the nozzle hose?
9. List three threshing methods for increasing the severity of the threshing action at the cylinder.
10. When large quantities of completely threshed grain are found in the tailings, what adjustments would you make?
11. How do you check the brakes to see that they are in good working order?
12. How many can safely ride on a combine?
13. What should the operator do before he starts the combine?
14. Should the threshing portion of the combine be running when traveling to and from the field?
15. How do you operate a combine when going downhill?
16. When finishing combining for the day, how should the combine be adjusted or serviced when being parked overnight?
17. What are your local regulations concerning operation of a combine on the highway or moving from field to field?
18. Do you know the instruments and controls and their uses and functions?
19. What do you do after storage or at the beginning of the season to prepare your combine for field operation?
20. What daily attention should be taken concerning the combine?
21. When completely threshed grain is being carried over the straw racks and deposited on the ground behind the machine with the straw, what adjustments would you make?

(The following are questions on the fundamentals of combining)

22. Is the crop in a threshable condition? If it is, what makes it so?
23. How do you adjust a combine to suit the particular crop being harvested?
24. At what speed do you run the combine mechanism during operation?
25. How do you select the proper ground speed, given the crop?
26. What happens when you drive too fast in a crop?
27. When combining crops such as beans, peas, etc., why is it desirable to keep the combine relatively loaded at all times?
28. What height do you cut the crop and why?
29. When the crop is down and tangled, what ground speed should be used?
30. How far open should the chaffer, chaffer extension and shoe sieve be? How can you tell?
31. What effect do weeds and other materials have on your combining operation?
32. What should the operator consider before starting the engine of the combine?

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33. List two methods of overloading a combine.
34. How do you properly stop the engine of a combine?
35. Is your operator's seat adjustable, and if so, how do you use it?
36. If your combine is equipped with flashing or warning lights, how are they operated?
37. What damage can be caused by leaving the platform in the raised position during storage?
38. Why is it important to have a level platform height? What is the proper reel speed and position?
39. What are the adjustments on the platform auger?
40. How do you change the cylinder speed?
41. What should one do when one cylinder bar becomes damaged on the cylinder?
42. How do you unclog a choked cylinder?
43. How do you adjust the concave clearance?
44. What is the purpose of the tailings auger, and what can the tailings tell the operator?
45. What precautions must be taken with drive belts?
46. What precautions should the operator take when inspecting a straw chopper?
47. What precautions must the operator take when refueling the combine?
48. How do you check to see if there is enough water or antifreeze in the radiator of a combine?
49. If the water in the cooling system is hot, and water is to be added, what precautions must be taken?
50. How do you check the oil on the engine of the combine?
51. How do you adjust the fan speed on the combine?
52. When and where do you lubricate the combine?
53. If you must tow your combine for some reason, where would you hook the chain?
54. How do you avoid static electricity buildup generated by belt work on the combine?
55. What is the recommended tire pressure, and how do you check it?
56. How can the operator tell if the brakes are working properly?
57. Where does the operator go to find out the correct adjustments for the crop he is working in?
58. Where does the operator look to analyze mechanical problems for their probable causes?

C. Important safety practices

1. Review the operator's manual.
2. Only the operator should be allowed on the operator's platform when the combine is in operation.
3. Clothing worn by the operator should be fairly tight and belted. Loose jackets, shirts or sleeves should never be worn because of the danger of getting caught in moving parts.
4. Have a pressurized dry chemical fire extinguisher handy. It's a good idea to mount one on the operator's platform.
5. Be sure shields and guards are in place and in good condition before starting into the field.
6. Use the handrail when mounting the combine.
7. Make sure everyone is clear of the combine before starting so they cannot be struck by moving parts or caught in a drive belt or chain.
8. Be especially careful when operating on hillsides. The combine may tip sideways if it strikes a hole, ditch or other irregularity. Keep the combine in gear when going downhill.

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9. When transporting the combine on a road or highway at night or during the day, use accessory lights and SMV emblems to provide adequate warning to operators of other vehicles. Check your local governmental regulations in this regard.
10. Shut off the combine to clean, oil or adjust it.
11. Lower safety latch when working on cutting platform.
12. Clear obstructions off the cutting platform only when the combine is stopped and the engine is shut off.
13. Keep the operator's platform clean. Do not use it as a place to carry loose tools, lunch boxes, etc.
14. Keep the engine free of dust, chaff and straw to prevent the possibility of fires.
15. Refuel your combine only when the engine has been shut off and cooled. Do not smoke or have an open flame when refueling.
16. Refill the radiator only when the engine is stopped or idling slowly. Combines have a pressure cooling system. To avoid being scalded when the radiator cap is removed, first turn the cap slightly to the stop which allows steam to escape through the overflow pipe. After all pressure is relieved, remove the cap.
17. Move ground speed control to reduce speed before applying brakes. Lock brakes together when transporting to avoid drawing combine to one side. Quick stops can result in combine nosing forward. Drive with care to allow controlled application of brakes at all times.
18. Be sure the gearshift lever of your combine or speed range lever on hydrostatic drive combines is in neutral and clutch pedal fully depressed before starting the engine.
19. Always shut off the engine when you:
    a. Leave the seat of the combine.
    b. Carry out any work on any combine drive part (main drive cylinder, straw walkers). Unintentional movement of the hydraulic control lever can cause serious accidents and damage.
    c. Work in or on the grain tank.
20. Clean up any oil or grease spots from the operator's platform, ladders or controls.
21. Check clearance carefully before driving the combine under electric wires, entering buildings or passing under bridges, etc.
22. Always clear a plugged cylinder with the cylinder clearing wrench -- not by using decreased engine power. The use of engine power to clear the cylinder can result in damage to the cylinder drive reduction gear.
23. The operator must be seated when combine is moving at high speeds or over rough ground.

D. Suggested activities

1. Demonstrate the adjustment and operation of the grain combine.
2. Have students operate and adjust the combine.
3. Simulate an actual field check for combine losses.
4. Determine how much it costs to do a poor job of combining.
5. There are several other student exercises listed in the specific supplemental references.

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VI. UNDERSTANDING HOW TO SAFELY OPERATE A FORAGE HARVESTER

A. Content outline

1. Adjusting a forage harvester
2. Operating a forage harvester
3. Maintaining a forage harvester
4. Understanding safety procedures to follow when using a forage harvester

B. Anticipated problems, questions and concerns of students

1. How do you adjust the wheel spacing on your forage harvester?
2. When and where do you lubricate the forage harvester?
3. How do you hitch the forage harvester to the tractor?
4. How tight should the belts be?
5. What is the proper adjustment for chain tension on your forage harvester?
6. How is your forage harvester adjusted to allow it to be transported?
7. How do you set the forage harvester to give the desired theoretical length of cut?
8. What is the theoretical length of cut?
9. What is the cylinder speed on your forage harvester and how is it adjusted?
10. Where are the shear bolts and slip clutches on your forage harvester?
11. When excessive quantities of "long" material are found in the forage wagon, what adjustments should be made on the forage harvester?
12. Where would you expect to find the greatest wear on a shear bar -- near the center, or near the end?
13. How do you sharpen the knives on your forage harvester?
14. Why should an operator torque the cylinder bolts on a forage harvester?
15. What should the operator know about the shear bar?
16. Can you adjust the feed roll on your forage harvester?
17. What should the operator know about gathering chains on the row crop head?
18. How do you adjust the register of the sickle on the row crop head?
19. What is the function of the crop deflector on the direct cut head?
20. What is the crop deflector on the direct cut head?
21. How do you adjust the height of the row crop or direct cut head?
22. How fast should the reel speed be?
23. As an operator, do you know all the controls and their functions?
24. How do you break in a new forage harvester before going into the field?
25. Why is it a good idea to check for loose bolts before operating your forage harvester?
26. If your unit becomes clogged, how do you unclog it?
27. How fast should you feed material into the forage harvester?
28. Is your forage harvester a 540 or a 1,000 rpm unit?
29. What is the proper tire inflation pressure for your forage harvester? Why is it important?
30. Why must knives always be equally spaced on a cylinder-type forage harvester?
31. What is a good source of solutions for trouble-shooting problems?
32. If you have a self-propelled forage harvester, how do you start the engine? What should you be aware of in terms of operation in the field and on the highway?

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33. If your forage harvester is a self-propelled unit, can it be used like a tractor?

C. Important safety practices

1. When unclogging or removing dirt from the forage harvester, disengage all power, shut off the engine, and wait until the harvester cutter head has stopped rotating.
2. Stand clear of the discharge outlet while the harvester is in operation.
3. Always have safety shields in place while operating.
4. Keep the cutter head door closed whenever the cutter head is running.
5. Use a block of wood in the cutter head to prevent the cutter from turning when adjusting the knives.
6. Keep hands, feet and clothing away from moving parts.
7. Hook up a 540 rpm harvester only to a tractor with a PTO speed of 540 rpm.
8. Start the tractor and set the throttle at slow speed, then engage the tractor PTO, then increase tractor throttle to proper PTO speed.
9. When mechanism becomes clogged, disconnect the power before cleaning to avoid all possibility of being injured by the feed roll, cylinder knives or other moving parts.
10. Keep off the machine while it is running, and keep others off to avoid injury from falling into gears, chains, belts, power trains or other moving parts.
11. After servicing, be sure all tools, parts or servicing equipment are removed from the machine.
12. When on the highway, use the SMV emblem and warning lights.
13. Review the operator's manual.

VII. UNDERSTANDING HOW TO SAFELY OPERATE A HAY MOWER

A. Content outline

1. Adjusting the hay mower
2. Operating the hay mower
3. Maintaining the hay mower
4. Understanding safety procedures to follow when using a hay mower

B. Anticipated problems, questions and concerns of students

1. How to you attach the mower to the tractor?
2. When and where do you lubricate the mower?
3. How do you check the cutter bar outer shoe ground pressure?
4. How do you check and adjust the cutter bar lift adjustment for the inner shoe?
5. What is the cutter bar lead, and how is it adjusted?
6. How can an operator check the knife assembly for a register and shear?
7. How is the break-back or a release mechanism on your mower adjusted?
8. What is the recommended PTO speed for your mower?
9. How do you secure the mower for transport down the highway?
10. How do you determine the proper ground speed for your mower?
11. How do you check for proper adjustment of the knife guards, the knife clips, the register, the cutter bar lead, the cutter bar tilt, the cutter bar lift and the drive belt tension?

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12. Where is a good place to look for trouble-shooting information if you are having problems with your mower?
13. How do you open a field using a hay mower?
14. How should you have the wheels of the tractor set for the best hay mowing operation?
15. How do you cut a square corner with a mounted-type sickle bar mower?
16. How do you replace the knife section on your mower?
17. What does the correct angle and bevel look like when you are sharpening the knife sections?
18. When difficult conditions make it necessary to slow down the travel speed, why should the operator shift to a lower gear rather than slow down the engine?

C. Important safety practices

1. Keep the mower free of riders at all times.
2. The driver is the only person permitted on the tractor at any time.
3. Always shut off the tractor engine and disengage the PTO before attempting to clean, adjust or lubricate the machine.
4. When leaving the tractor, always shut off the tractor engine, lower the mower to the ground and disengage the PTO.
5. Keep all nuts, bolts, screws and connections tight.
6. Keep safety releases properly adjusted. The break-out latch must be able to release to provide safe operation.
7. Always grasp the rear edge of the bar, keeping your fingers clear of the guards, when raising the cutter bar to transport position.
8. When transporting the mower, disengage the PTO and be certain the transport rod or device is securely attached to the cutter bar and the lower frame of the mower.
9. When moving the mower short distances, raise the cutter bar with the hydraulic lift or spring and disengage the PTO.
10. See that all safety shields, including the PTO master shield on the tractor are in place and properly secured. Make sure that there is no one near the machine before starting it.
11. Be sure that the tractor PTO is disengaged before starting the tractor engine.
12. Shut off the machine before attempting to remove any obstructions from the belt or knife.
13. Slow down and stay alert when operating close to ditches or fences or on hillsides.
14. Check clearances carefully before driving the mower under electric lines or bridges or into buildings.
15. When transporting the machine on the highway, use the SMV emblem. Keep tractor and trailing equipment in complete control at all times.

D. Suggested activities

1. Demonstrate the proper adjustment and operation of a hay mower.
2. Have students adjust and operate a hay mower.
3. Have students identify hazardous areas on a hay mower.

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VIII. UNDERSTANDING HOW TO SAFELY OPERATE A BALER

A. Content outline

1. Adjusting a baler
2. Operating a baler
3. Maintaining a baler
4. Understanding safety procedures to follow when using a baler

B. Anticipated problems, questions and concerns of students

1. How can the operator determine the proper time to start baling hay?
2. Can correct raking and conditioning help the baler operation?
3. Why should the operator be concerned with the moisture content of the hay crop?
4. How do you attach the hay baler to the tractor?
5. How is the baler transported? Are there any special adjustments on your baler for transporting?
6. Why is it important to disconnect the PTO shaft when transporting your baler?
7. If your baler is equipped with an auxiliary engine, what precautions should be taken in the operation of this engine, and what should the operator be aware of concerning this engine?
8. In which direction do you travel with the baler on the windrow?
9. How do you adjust the pick-up height?
10. What do the needles on a baler have to be in proper time with?
11. How do you adjust the bale density? Why is this important?
12. Why is proper timing necessary on a baler?
13. What other important adjustments are on a baler that the operator should know?
14. Where would an operator find information pertaining to the knotter on a baler?
15. How do you replace the twine or wire in a baler?
16. Where are the safety clutches and shear pins on your baler located?
17. What precautions should be taken on an auxiliary engine model before turning the flywheel on the baler?
18. If you have a problem while baling, what is a very good source for trouble-shooting?
19. What needs lubricating on your baler, and when should this be done?
20. What things do you check on your baler before you go into the field?
21. What are the local regulations concerning the transportation of balers on public roads?
22. How does the operator start the baler when entering a field for the first time?
23. How do you make a splice in your twine or wire if it breaks?
24. What determines the length of the bale?
25. What is the proper operating speed on your baler and how is it measured?
26. How are bale weight and tension adjusted?
27. How should the wheel spread on your tractor be adjusted for baling?

C. Important safety practices

(Before Operation)

1. Review the operator's manual.

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2. Shut off the tractor or baler engine when fueling. Anyone within 50 feet of the fueling operation is in a no smoking--no open flame area. Be sure to ground the hose nozzle on your can and funnel.
3. A dry chemical fire extinguisher should be in place and mounted to the power unit in good operating condition.
4. Make sure everyone is in the clear before starting the machine.
5. Inspect the bale chamber before operating to make sure that there are no obstructions.
6. See that all safety shields are in place and properly secured before starting to operate the baler.
7. After servicing, be sure that all tools, parts and servicing equipment are removed before starting the baler.
8. The tractor operator is the only person allowed to ride on the tractor, unless it has a crush-resistant cab.
9. Be sure the right PTO shields are used and properly secured.
10. Set slip clutches so they will function when obstructions are encountered.
11. The tractor operator must do the hitching. This keeps a person from standing between the tractor and unit while hitching.

(During Operation)

12. Shut off PTO and motor before pulling hay from the pick-up.
13. Remove or pull twine or wire from the bale chamber twine or wire mechanism after the baler has been shut down.
14. Keep the tractor and baler free of trash to avoid fires.
15. Slow down and stay alert when operating close to ditches or fences or on hillsides.
16. Keep hands, feet and clothing away from power-driven parts.
17. Stop the baler and shut off the tractor or baler engine before lubricating, cleaning or adjusting.
18. Disengage the drive and stop the engine before you leave the tractor seat.
19. Always remove spark plug wires from engine or PTO from tractor before doing any work in the opening or bale chamber.
20. Keep all nuts, bolts, screws and connections tight.
21. Provide a first aid kit. Treat all scratches, cuts, etc., with the proper antiseptic immediately.
22. Before servicing or adjusting the baler, removing bales or other materials from it, or hitching a wagon to it, always:
    a. Disengage all power.
    b. Shut off the engine.
    c. Wait until baler flywheel has stopped rotating.
23. On balers with auxiliary engines, fill the fuel tank after the engine has been shut down and cooled for at least 5 minutes.

(After Operation)

24. Block the wheels securely if the machine is parked outdoors.
25. Take all precautions so that children cannot start the tractor or baler engine while they are unattended.

(Highway Operation)

26. Check clearance before driving machine on bridges or into buildings.

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27. Use SMV emblems during highway operation.
28. Comply with your state and local laws governing highway safety and with regulations for moving machinery on the highway.
29. Maintain complete control of the machine at all times when traveling on the highway.

D. Suggested activities

1. Demonstrate adjustment and operation of a baler.
2. Have students adjust and operate a baler.
3. Have students locate hazardous areas on a baler.

IX. UNDERSTANDING HOW TO SAFELY OPERATE A POTATO DIGGER

A. Content outline

1. Adjusting a potato digger
2. Operating a potato digger
3. Maintaining a potato digger
4. Understanding safety procedures to follow when using a potato digger

B. Anticipated problems, questions and concerns of students

1. What should an operator check before he goes out into the field to make sure the digger is ready?
2. How is the potato digger attached to the drawbar?
3. How fast and how deep should you run the potato digger?
4. How can you tell if you have inadequate soil separation? What do you do about this?
5. Why is it important that the shovels scour?
6. Painted shovels are most useful under what type of field conditions?
7. How do you tell if the elevator chain is properly adjusted?
8. What adjustments may be made for separation? Where are they located?
9. What precautions should be taken in stony ground?
10. What adjustments would you make if your potato digger was "slicing" potatoes?
11. How do you adjust the elevator speed?
12. What safety devices are present and where are they located?
13. How do you adjust the wheel setting?
14. Where and when do you lubricate?
15. How tight should the safety clutch be?

C. Important safety practices

1. Always stop the machine and tractor engine before lubricating or adjusting the digger.
2. The tractor operator should be the only person on the tractor while it is being operated.
3. Be sure that clothing worn by the operator is fairly tight. Loose jackets, shirts, skirts or sleeves should not be permitted because of the danger of getting into moving parts.
4. All women operators should wear slacks or trousers.

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5. Keep the tractor in gear when going down steep grades.
6. Keep a firm grip on the steering wheel at all times.
7. Be sure that all shields are kept in place and are properly attached.
8. When transporting the potato digger, avoid field speeds in excess of 10 miles per hour.

X. UNDERSTANDING HOW TO SAFELY OPERATE A MOBILE PEA VINER

A. Content outline

1. Adjusting a mobile pea viner
2. Operating a mobile pea viner
3. Maintaining a mobile pea viner
4. Understanding safety procedures to follow when using a mobile pea viner

B. Anticipated problems, questions and concerns of students

1. What size tractor is required to pull a mobile pea viner?
2. What speed should a tractor be operated at when pulling a mobile pea viner?
3. What are the operating parts of a mobile pea viner?
4. How do you start a mobile pea viner?
5. What adjustments need to be made in order to begin operation of a mobile pea viner?
6. How do you unclog a mobile pea viner?
7. How often should the tension of aprons be checked?
8. How do you adjust the apron of a mobile pea viner?
9. How do you open a field to use a mobile pea viner?
10. If you encounter heavy windrows, how do you keep the pea viner from becoming clogged?
11. How can the tachometer be used to assist in operating a pea viner?
12. What are the recommended cylinder speeds that should be used when operating a pea viner?
13. How often should the pea viner be lubricated?
14. What parts of the pea viner need to be lubricated?
15. Why should the motor be stopped before entering any part of the pea viner?
16. How often should the air cleaner be serviced?
17. How do you level the pea viner?
18. How should you store the pea viner?

C. Important safety practices

1. Be sure the viner is on level ground and jack in an upright position before raising. Keep hands and feet away.
2. Before engaging the clutch to run the viner, be sure all persons are safely clear of moving parts.
3. Do not make adjustments with viner or engine running.
4. Should vines or other material become jammed in the pickup, shut off engine before clearing jam. Never enter the feeder or pickup area with engine running.

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D. Suggested activities

1. Demonstrate the adjustment and operation of a pea viner.
2. Have students adjust and operate a pea viner.
3. Have students locate the hazardous areas of a pea viner.

XI. UNDERSTANDING HOW TO SAFELY OPERATE A FEED GRINDER

A. Content outline

1. Adjusting a feed grinder
2. Operating a feed grinder
3. Maintaining a feed grinder
4. Understanding safety procedures to follow when using a feed grinder

B. Anticipated problems, questions and concerns of students

1. Why should the feed roll be in float position to prevent damage to the machine when grinding hay, ear corn or cobs?
2. What tractor PTO speed should be maintained with your specific machine?
3. If your machine has two or more speeds for the feeding mechanism, under what conditions should these different speeds be used?
4. Why is it important to have the hammer balanced on the hammer mill?
5. Where is the clean out door and what is it used for?
6. What precautions must be taken when mixing?
7. Where would an operator find information on his machine to adjust for the proper texture and fineness of grind?
8. What are the safety devices located on your machine?
9. Why is it important to use only factory-recommended shear bolts?
10. How do you start a particular feed grinder?
11. Why is it important for an operator to know the points of lubrication on a machine?
12. What is the function of a magnet attachment on a feed grinder?

C. Important safety practices

1. Keep all shields in place.
2. Stop the machine to adjust and lubricate it.
3. When the mechanism becomes clogged, disengage the power before cleaning.
4. Keep hands, feet and clothing away from power-driven parts.
5. Keep off the implement unless a seat or platform is provided. Keep others off.
6. When feeding materials such as bale slabs into a grinder, use extreme caution and keep hands and loose clothing away from the feed roll.
7. When mixing, keep clear of the mixing auger while it is in motion. Do not put hands, feet or any foreign object into the mixing drum.

D. Suggested activities

1. Take a field trip to observe a feed grinder in operation.
2. Demonstrate adjustment and operation of a feed grinder
3. Have students adjust and operate a feed grinder.
4. Have students locate hazardous areas of a feed grinder.

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XII. UNDERSTANDING HOW TO SAFELY OPERATE A CROP DRYER

A. Content outline

1. Adjusting a crop dryer
2. Operating a crop dryer
3. Maintaining a crop dryer
4. Understanding safety procedures to follow when using a crop dryer

B. Anticipated problems, questions and concerns of students

1. Why is it a good idea to turn the fans over by hand before starting them?
2. How much grain should be in the dryer?
3. How can you turn off the fuel supply on your dryer?
4. What is the starting procedure on your dryer?
5. Where are the feed adjustments located on your dryer?
6. Where are the safety devices, and what is the function of each?
7. If you have trouble with the heating controls, what is the safest practice to follow?
8. How do you determine the correct drying temperature for your crop?
9. What type of lubrication is necessary for your crop dryer? How often do you lubricate?
10. How do you clean out the dryer after you are finished?
11. How do you detect hot spots?
12. What do you do with clogged screens?
13. How do you adjust the belt tension?
14. Why is it necessary to protect fuel lines and regulator valves?.

C. Important safety practices

1. Shut the dryer down before repairing or cleaning.
2. Keep the fill tank covered.
3. Wear reasonably fitted clothing.
4. Have an expert repair or replace heating controls and fuel regulating valves.
5. Watch for hot spots when starting the drying operation.

D. Suggested activities

1. Take a field trip to observe a crop dryer in operation.
2. Demonstrate the adjustment and operation of a crop dryer.
3. Have students adjust and operate a crop dryer.
4. Have students locate hazardous areas of the crop dryer.

XIII. UNDERSTANDING HOW TO SAFELY OPERATE A FORAGE BLOWER

A. Content outline

1. Adjusting a forage blower
2. Operating a forage blower
3. Maintaining a forage blower
4. Understanding safety procedures to follow when using a forage blower

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B. Anticipated problems, questions and concerns of students

1. What are the things to check when hitching the blower to the tractor?
2. Is there any special blocking or stabilizing that has to be done to your blower before this hookup?
3. Where are the shear bolts and safety devices on your blower?
4. When and where do you lubricate your blower?
5. What is the maximum fan velocity adjustment on your forage blower? How do you make this adjustment?
6. How do you start the blower?
7. How do you feed material into the blower?
8. How is the blower shut down after you are finished with it?
9. If the operator has a problem, where should he go to find information to solve this problem?
10. What is the correct PTO speed on the forage blower you are working with?
11. If you are operating a new blower, is it necessary to break it in?
12. What are the points of lubrication on the PTO shaft?
13. If your blower is equipped with a water nozzle, when and how is it attached?
14. What should the operator know concerning the injection of water when you are blowing material with your forage blower?
15. What precautions must be taken when you are transporting the blower?

C. Important safety practices

1. Shut off the power before attempting to clean, lubricate or make adjustments on the blower.
2. Check to see that all persons are clear of the blower, and that all tools and foreign materials are removed before engaging the PTO.
3. Do not step on or over the feed table while the blower is operating.
4. Replace safety shields -- all shields should be in place before operating the blower.
5. Secure the transport mechanism on the feed table before transporting the blower.
6. Do not run the blower fan over the maximum speed recommended by the manufacturer.
7. Clothing worn by the operator should fit reasonably well. Avoid loose jackets, shirts, skirts and sleeves.
8. Stay with your machine while it is operating, but avoid moving parts.
9. Check the following points when setting up the blower:
   a. Is the tractor in the proper position?
   b. Is the blower stable?
   c. Is the PTO properly aligned?
   d. Are all shields and safety devices in place?
   e. Does the fan have clearance in the blower?
   f. Have the adjustments been made for proper fan operation?
   g. Do the belts have proper tension?
   h. Is the wagon in correct loading position?
   i. Is the pipe assembly in a proper position?

D. Suggested activities

1. Take a field trip to observe a forage blower in operation.
2. Demonstrate the adjustment and operation of a forage blower.

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3. Have students adjust and operate a forage blower.
4. Have students locate the hazardous areas of a forage blower.

XIV. UNDERSTANDING HOW TO SAFELY OPERATE MATERIALS HANDLING EQUIPMENT

A. Content outline

1. Adjusting materials handling equipment
2. Operating materials handling equipment
3. Maintaining materials handling equipment
4. Understanding safety procedures to follow when using materials handling equipment

B. Anticipated problems, questions and concerns of students

1. What purposes do the trough covers provide?
2. Why is it important that an auger conveyor be protected from weather as well as damage from livestock, falling objects, etc.?
3. Why is it important to shut off the motor before opening and closing the drop out door for cleaning the drawer?
4. What advantage is there in starting the auger conveyor and bunk feeder before materials are delivered to them?
5. What precautions must be taken during cold weather operation of this equipment?
6. Why is it important that the trough covers are always in place during the operation of the conveyor and when you are raising or lowering or changing the position of the conveyor?
7. What dangers are there in oiling or greasing the auger conveyor while it is running?

(Vertical Auger)

8. How high can the vertical auger be erected?
9. Grain bin spouting can be as low as 45° in slope for use with whole grain; however, a 60° slope is required for processing feed with a vertical auger. Why?
10. When starting the vertical auger for operation, why is it important to run the auger slowly?
11. What precautions must be taken when running an empty auger?
12. When starting an auger for the first time, why is it important to operate at half speed for the first 500 to 800 bushels?
13. If the auger is stopped for any reason with the tube full of grain, what should the operator do before starting?
14. What should the operator of the auger realize concerning driving the auger at a higher speed than recommended?
15. The amount of corn the auger can handle by volume per hour is greatly dependent on what factors?
16. Generally speaking, the higher the moisture content, the lower the capacity and the greater the horsepower required. Why?
17. When handling high moisture corn, it is recommended to use a PTO drive only. Why?
18. What precautions should the operator of the auger know concerning the proper connection of the PTO shaft?

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19. What is the "clean door" and how is it used?
20. What types of materials has the vertical auger been designed to handle?
21. What types of materials should not be handled by a vertical auger?
22. Whenever excessive vibration occurs, something is wrong. What equipment is needed and what precautions should be taken?

(Portable Auger)

23. Why is it important to have the proper upper link speed when using a portable elevator?
24. If your auger has different drive sprockets, which one should be used when?
25. What are the power requirements for the portable auger?
26. What precautions should be taken when transporting a portable auger?
27. When assembling sections of the auger flightening, what precautions must be taken with their alignment?
28. How frequently should the machine be lubricated? Why?

(Auger Bunk Feeder)

29. What should be checked on your machine before operation?
30. What are the safety devices on this unit?
31. How can an operator turn off the unit in an emergency?
32. How tight should the motor drive belts be tightened? Why?

C. Important safety practices

1. Lower the auger to the ground before attempting to disassemble.
2. Have adequate equipment to raise or lower the unit before attempting to disassemble the auger.
3. Operate the PTO from the tractor seat. Disconnect the PTO shaft when not in use.
4. Make certain the intake guard in the portable auger is in place before operating the intake.
5. The head end of the portable auger must always be supported when the auger is in operation.
6. When the portable auger is kept outdoors, tie it down or keep it as low as possible.
7. Comply with state laws whenever it is necessary to transport the portable auger on public roads.
8. Make sure to have the power for the portable auger disengaged before starting the engine.
9. Keep all shields in place, including the hopper safety cover.
10. Keep hands, feet and clothing out of the hopper and away from the power-driven parts.
11. Shut off all motors before servicing, adjusting or inspecting the auger conveyor.
12. Be sure cable suspended units on vertical augers are properly suspended when being raised, lowered or pivoted, and that nuts on cable clamps are torqued properly.
13. Be sure trough covers are always in place during the operation of the conveyor and before raising, lowering or changing the position of the conveyor.
14. Stay out of the feed bunk while the auger is operating.

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15. Always shut off the main power source before working on a bunk feeder mechanism. If possible, lock the main power source switch in the off position or remove all fuses from the motor controller box. The person working on the machine should put the fuses in his pockets to prevent someone else from replacing them and inadvertently starting up the machine.
16. If a silo unloader is used in conjunction with an auger bunk feeder, it is recommended that the silo unloader also be disconnected before doing any work on the feeding mechanism.

D. Suggested activities

1. Take a field trip to see materials handling equipment in operation.
2. Demonstrate adjustment and operation of each type of materials handling equipment.
3. Have students adjust and operate materials handling equipment.
4. Have students identify hazardous areas when working with materials handling equipment.

XV. UNDERSTANDING HOW TO SAFELY OPERATE POWER SELF-UNLOADING WAGONS, TRAILERS OR MANURE SPREADERS

A. Content outline

1. Adjusting self-unloading wagons, trailers or manure spreaders
2. Operating self-unloading wagons, trailers or manure spreaders
3. Maintaining self-unloading wagons, trailers or manure spreaders
4. Understanding safety procedures to follow when using self-unloading wagons, trailers or manure spreaders

B. Anticipated problems, questions and concerns of students

1. What should the operator look for when inspecting the tires?
2. What is the proper tire inflation? Why is it important?
3. What should the operator keep alert for when pulling a wagon or spreader?
4. What are the advantages of placing the weight on the front end of a tractor while using the unit on hilly land? What are the disadvantages?
5. What precautions should the operator take in making turns or backing up when the power shaft is connected to the tractor?
6. What are the local regulations for towing a forage wagon or manure spreader on highways?
7. If you are having problems with the operation of self-unloading wagons, what would be a good source to look at for a possible solution?
8. What is the hauling capacity of your particular forage wagon or your manure spreader? Why is it important for the operator to know the capacity?
9. How do you hitch the forage wagon or manure spreader to the tractor drawbar?
10. Where are the safety devices located on your forage box?
11. Identify the forage box unloader controls.
12. What various adjustments are available on your forage box?

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13. When and where do you lubricate the various mechanisms on the forage box?
14. If you are putting supplement in with the chopped feed in the forage box, what precautions must be taken for your own safety?
15. What is the proper procedure for loading a forage box?
16. Why is the steering and wheel alignment important to the operator when using a forage box?
17. Why should you run a brand-new manure spreader before putting materials into it to go out into the field?
18. How do you load the manure spreader with materials?
19. When the manure spreader is loaded with materials, how do you engage the manure to facilitate unloading?
20. How do you adjust the rate of spreading the manure or materials from your manure spreader?
21. At what PTO speed should the spreader be run?
22. Where are the clutches and safety devices on your manure spreader located?
23. How do you adjust the axle on your manure spreader?
24. How is the manure spreader supported when not attached to the tractor and you want to load materials into it?
25. What is the proper chain tension for the apron and other chains on your manure spreader?
26. What kind of weight do you have when you have a full load on your spreader and how does this affect its operation?
27. When and where do you lubricate your manure spreader?
28. What mistakes do operators make that result in accidents with manure spreaders?
29. Where are the adjustments on your manure spreader and what are their functions?

C. Important safety practices

1. Shut off the tractor before you clean, lubricate or adjust any part of the spreader or forage mechanism.
2. Shut off the tractor engine before trying to unlock the feeding mechanism or remove any material.
3. Operate the machine after you have checked to see that PTO shaft guards and shields are properly in place.
4. Allow only the operator on the tractor. Do not allow any riders on the forage wagon or spreader.
5. Check the machine thoroughly for possible loose parts or bolts after making adjustments.
6. Make sure all tools are taken out of the machine after making adjustments.
7. When you unhook a wagon on a slope, first block the wheel and then disconnect the wagon.
8. Keep hands, feet and clothing away from power-driven parts.
9. The drawbar of the tractor and the front of the forage wagon are off limits to passengers.
10. Always use the SMV emblem on the public roadway. Keep the emblem clean and replace every two to four years or whenever the center triangle has faded.

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11. Start the wagon unloader or spreader only after you have checked to be sure everyone is clear of the machine.
12. Shut off the tractor engine before you attempt to pull material from any part of the spreader or forage box.
13. Don't get off the tractor while the spreader is in operation.
14. Always select a safe speed, depending on the terrain.
15. Use extreme care on steep slopes or sharp drop-offs.
16. Don't start the manure spreader in cold weather without first checking to see if the apron is frozen to the bottom of the spreader.
17. Lock the drawbar in a fixed position when attaching a wagon or spreader.

D. Suggested activities

1. Take a field trip to see self-unloading wagons in action.
2. Demonstrate the adjustment and operation of self-unloading wagons.
3. Have students adjust and operate a self-unloading wagon.
4. Have students point out the hazardous areas of a self-unloading wagon.

XVI. UNDERSTANDING HOW TO SAFELY OPERATE A POST HOLE DIGGER

A. Content outline

1. Adjusting post hole diggers
2. Operating post hole diggers
3. Maintaining post hole diggers
4. Understanding safety procedures to follow when operating post hole diggers

B. Anticipated problems, questions and concerns of students

1. How do you mount a post hole digger on your tractor?
2. Where is the shear bolt or pin located? Why should the correct shear bolt or pin be used?
3. What lubrication is required?
4. How do you replace points and cutting knives?
5. Does your post hole digger require stabilizing bars? If so, how are they installed?
6. How should you store the post hole digger for ease of attachment?
7. How is the auger on your digger lowered into the ground?
8. How should your tractor throttle be set when using the post hole digger?
9. How can the operator adjust the depth of the hole?
10. What procedure do you follow in order to drill a clean hole?

C. Important safety practices

1. Always disengage tractor PTO before dismounting the tractor.
2. Always lift auger free of hole before moving forward.
3. Shut off the power to clean, oil or adjust the machinery.
4. Keep hands, feet and clothing away from power-driven parts.
5. Use the break lock on the tractor when needed.

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D. Suggested activities

1. Demonstrate the adjustment and operation of a post hole digger.
2. Have students adjust and operate a post hole digger.
3. Have students point out the hazardous areas of a post hole digger.

XVII. UNDERSTANDING HOW TO SAFELY OPERATE A POWER POST DRIVER

A. Content outline

1. Adjusting power post drivers
2. Operating power post drivers
3. Maintaining power post drivers
4. Understanding safety procedures to follow when operating power post drivers

B. Anticipated problems, questions and concerns of students

1. How do you attach the unit to a tractor?
2. What requires lubrication?
3. Where and when do you use ballast on the driver?
4. How do you drive a vertical position on a hillside?
5. How do you start and stop the driver?
6. How is the post placed into the unit?

C. Important safety practices

1. Close the door after putting post in and before starting to drive.
2. Keep post driving a one-man operation.
3. Lock driver when transporting.

D. Suggested activities

1. Demonstrate the adjustment and operation of a power post driver.
2. Have students adjust and operate a power post driver.
3. Have students point out the hazardous areas of a power post driver.

XVIII. UNDERSTANDING HOW TO SAFELY OPERATE A POWER ROTARY TILLER

A. Content outline

1. Adjusting power rotary tillers
2. Operating power rotary tillers
3. Maintaining power rotary tillers
4. Understanding safety procedures to follow when operating power rotary tillers

B. Anticipated problems, questions and concerns of students

1. How do you attach the power rotary tiller to the tractor?
2. At what PTO speed should you operate the rotary tiller?
3. How do you control the depth of the rotary tiller?

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4. How do you replace the tines or knives on the rotary tiller?
5. When and where do you lubricate a specific rotary tiller?
6. What are the safety devices on your rotary tiller and how are they adjusted?
7. Where are the safety shields on your rotary tiller and how are they adjusted?
8. Why should you match your tractor H.P. to the rated power requirements of the tiller?

C. Important safety practices

1. Wear reasonably fitted clothing--loose-fitting clothing is easily caught in moving parts.
2. Shut the tractor engine off before raising the rear plate to look under the tiller or performing other operations that would place hands or feet under the tiller.
3. Stay clear of all moving parts.
4. Before operating the tiller, be sure all stones, branches and other debris are removed to avoid possible danger to the tiller and people around it.
5. Be sure the tiller is properly mounted and that all shields are in place and properly secured before starting to operate the equipment.
6. Disengage the PTO before starting the tractor engine.
7. Shut off the tractor whenever you leave the unit. It should be operated by persons acquainted with its use and willing to follow the rules for safe operation.
8. Maintain a slow ground speed when transporting on hillsides or over rough ground, and stay away from the edge of ditches.
9. Keep everyone away from the area behind the tiller while operating.
10. Disengage the PTO and stop the tractor engine before attempting to clean or work on the tiller.

D. Suggested activities

1. Demonstrate the adjustment and operation of a power rotary tiller.
2. Have students operate and adjust a power rotary tiller.
3. Have students point out the hazardous areas of a power rotary tiller.

XIX. USING FARM EQUIPMENT ON HIGHWAYS

A. Content outline

1. Understanding highway laws that pertain to farm machinery
2. Driving and pulling farm machinery on highways
3. Understanding the safe use of farm machinery on highways

B. Anticipated problems, questions and concerns of students

1. What is the maximum allowable width of farm machinery allowed on the highway?
2. What is the maximum load height allowable on highways?
3. What is the maximum length of machinery allowable on the highway?

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4. Does farm machinery need a license to operate on highways?
5. What lighting is required for operation on highways at night?
6. What is the SMV emblem?
7. Where should the SMV emblem be placed?
8. When should an SMV emblem be used?
9. How fast should machinery be transported on the highway?
10. What percent of all fatal tractor accidents occur on public roads?
11. Should the brake pedals be interlocked before highway travel? Why or why not?
12. Why must slow moving vehicles be marked as slow moving vehicles?
13. When should you drive on the shoulder of the road?
14. When should you drive on the pavement of the highway?
15. What should you do if traffic begins to build up behind you on a highway?
16. What are the state laws that pertain to machinery operation on highways?

C. Suggested activities

1. Invite a member of the State Police to discuss highway laws and safety in relation to farm machinery.
2. Have students inventory farm machinery to determine whether or not it is equipped with SMV emblems.
3. Have the class present a radio program on the safe use of farm machinery on public highways.
4. Have students assemble a list of state laws that pertain to the safe use of machinery on public highways and distribute them to local farmers as an FFA activity.
5. Take the students on a field trip to a farm that has its equipment properly maintained for highway use and demonstrate effective highway driving techniques.

D. References

1. Tractor Operation and Daily Care, pages 101-106.

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Testing Procedures

The student must have successfully completed the Vocational Agriculture Training Program in Safe Tractor Operation before enrolling in this program. Both programs must be successfully completed before he may be issued an exemption certificate for machinery operation.

The student must successfully pass a written examination indicating that he is thoroughly familiar with the safety and operational procedures involved in machinery operation. The student will then demonstrate by a practical operational test that he can operate farm machinery in a safe manner.

I. Written Test

The written test should consist of a minimum of 50 objective questions and be consistent with the instruction given. Questions used will be selected by the individual teacher. They will be consistent with safe farm machinery operation, generally applicable to equipment used in the community, and based upon the instruction given. If repeat exams are given, a different exam should be used.

The questions should be of a discriminatory nature involving realistic choices for the proper responses. Some examples of discriminatory questions are:

When stopping and dismounting from a self-propelled combine, the first and most important practice is to:

a. Shift into low gear.
b. Set brakes.
c. Disengage power lever.
d. Shut off engine
e. Unfasten seat belt

Answer: c. Disengage power lever.

True or false: Bale density adjustments are made with the spring-loaded tension bars, and affect the bale shape and weight.

Answer: True.

II. Practical Test

The student must demonstrate his ability to safely operate those machines he expects to be using. This can be done on the home farm, land laboratory, school farm or other areas that are satisfactory to the teacher and student. It can be done during the laboratory periods, field trips or supervised farm visits by the teacher. This test of operational proficiency should not be demonstrated as a part of the student's on-the-job or employment experience. It must be demonstrated to the teacher and to his satisfaction. The student will pass the operational test as a requirement for the successful completion of this program.

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Directions for Farm Machinery Operator's Test

1. A student must pass the tractor operator's test and the written farm machinery operator's test before taking the practical machinery operation test.

2. This test will involve three (3) separate phases or events:

   a. Begin with a tractor at a starting point, spot the tractor to a three-point hitch implement, attach the implement to the tractor, move the tractor and implement approximately 10 feet, then detach the implement from the tractor and return the tractor to the starting point.

   b. Begin with a tractor at a starting point, move the tractor to a self-unloading wagon, attach the wagon to the tractor drawbar, then properly connect the PTO shaft of the wagon to the tractor. Return to the tractor seat, engage the PTO and operate the unloading mechanism at low speed for approximately 30 seconds. Disengage the PTO, dismount and disconnect the PTO shaft from the tractor, return it to its proper transport position on the wagon, unhitch from the tractor drawbar and move the tractor back to the starting position.

   c. Begin with a tractor at a starting point, spot the tractor to an implement equipped with a remote hydraulic cylinder (with the implement in "transport" position). Connect the hydraulic hoses to the tractor, release the transport locking device (if present), operate the remote cylinder through one cycle, return the implement to transport position, engage the transport locking device, then disconnect the hydraulic hoses, replace dust protective devices and return the tractor to the starting point.

3. After the student has spotted the tractor to the implement, as outlined in paragraphs 2a, b or c, and made the required connection between tractor and implement, he will then give the teacher the opportunity to check and approve the connection between the tractor and the implement before the implement is operated or moved in any way.

4. The student must work in a safe manner at all times. He must be on the tractor any time the tractor is in gear, any time the PTO drive is engaged or any time the hydraulic controls are being operated.

5. Safe operating practices, including those set forth in the Safety Score Sheet, will be in effect at all times the student is actively involved in any of the phases of this test.

6. Certain unsafe acts, or failure to meet certain performance standards, may be used as evidence of lack of ability to pass this test:

   a. Putting the tractor in gear, engaging the clutch, engaging the PTO drive or operating any of the hydraulic controls without first being on the tractor seat.

   b. Fouling the tractor and any of the implements in any manner so as to damage the tractor or implement.

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c. Accumulating more than a total of 1,000 penalty points from the three acts outlined above, including safety penalties.

d. Any gross act of negligence or safety violation which, in the opinion of the teacher in charge, constitutes a major safety hazard to the students, teacher, spectators or equipment.

7. If a student fails to pass this test, but otherwise meets all the requirements for successfully completing this program, he may, at the discretion of the teacher in charge, be granted a second try. A second try, however, will be granted only after the student has had an opportunity for additional study and coaching.

Scoring Procedures

1. Scoring will be done on a "points off" or "points penalty" basis, and will cover both safety and operational skills as outlined on the attached score sheets.

2. Teachers may, at their discretion, require an applicant to stop or change the direction of travel or change his procedural methods if, in their opinion, damage may occur to equipment or injury may occur to a person.

Farm Machinery Operation Safety Score Sheet

_____
Student's Name

Procedure:

Each student will be scored on safety any time he is concerned with tractor or machinery operation. This includes practice, as well as before, during and after the machinery tests. Safety officials will be on hand to record violations during these periods.

Scoring:	No. of Times Found		Points Added
Starting Safety			
1. Failure to check neutral position with hand	_____	x100	_____
2. Failure to disengage clutch while starting engine	_____	x10	_____
3. Failure to check disengaged position of PTO with hand	_____	x50	_____
Driving Safety			
1. Failure to engage clutch gently	_____	x10	_____
2. Failure to ride on seat or stand safely on platform	_____	x100	_____
3. Skidding or spinning wheels when starting	_____	x100	_____

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4. Turning too short and fouling implement	_____x50	_____
5. Operation of tractor at unsafe speed	_____x20	_____
6. Moving tractor with brake set	_____x100	_____
7. Inadequate precautions when teachers, other students or spectators get in the way	_____x100	_____
8. Any turn which causes inside rear wheel of tractor to leave ground	Disqualifies Applicant	

Mounting and Dismounting Safety

1. Failure to set brake before dismounting	_____x50	_____
2. Failure to dismount to insert or remove drawbar pin	_____x20	_____
3. Failure to bring tractor to complete stop before dismounting	_____x100	_____
4. Failure to mount and dismount safely	_____x50	_____

Other Safety

1. Smoking	_____x20	_____
2. Extra riders	_____x100	_____
3. Loose-fitting clothing	_____x50	_____
4. Failure to give teacher an opportunity to check the completeness of the connection between tractor and implement	_____x100	_____
5. Failure to release and reset any transport locking device under Paragraph 2c	_____x100	_____
6. Failure to operate equipment as called for in Paragraphs 2a, b and c of the instructions in a safe manner	_____x50	_____

Total Safety Points Penalty _____

Farm Machinery Operation Score Sheet

_____
Student's Name

Procedure:

Two officials will be available for timing, recording scores and observing operation.

The student will start and warm up the tractor at a designated starting point. He will then move the tractor to the implement, perform the required operations and then return the tractor to the starting point. Time will not be recorded, but officials may set an unreasonably long time to finish the event.

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Rules:

1. No assistance will be allowed in any of the hitching or connecting operations.

2. Whenever dismounting from tractor, at least one brake must be set. For tractors with automatic transmissions, the selector lever must be set in the "park" or "lock" position.

3. Remember, officials must be given an opportunity to check the completeness and safeness of attaching the tractor to the implement as outlined in Paragraphs 2a, b, c and d of the instructions prior to his activating, moving or operating the implement.

	No.of Times Found		Points Added
Three-Point Hitch			
1. Tractor engine stalled	_____	x10	_____
2. Gears grated	_____	x10	_____
3. Additional attempts at spotting tractor	_____	x10	_____
4. Failure to use crank on lift arm (if needed to equalize lift arms to implement)	_____	x50	_____
5. Failure to lift implement from ground before moving it to new location	_____	x100	_____
6. Failure to lower implement gently	_____	x50	_____
Power Takeoff			
1. Tractor engine stalled	_____	x10	_____
2. Gears grated	_____	x10	_____
3. Additional attempts at spotting tractor	_____	x10	_____
4. Failure to first attach implement to tractor drawbar	_____	x50	_____
5. Failure to physically check to see that all shielding is properly attached, or that self-contained shield is free to rotate on PTO shaft	_____	x100	_____
6. Failure to gently engage PTO power to implement	_____	x50	_____
Remote Hydraulic Cylinder			
1. Tractor engine stalled	_____	x10	_____
2. Gears grated	_____	x10	_____
3. Additional attempts at spotting tractor	_____	x10	_____
4. Failure to place remote hydraulic control lever in neutral or non-pressure position before making or breaking connection	_____	x50	_____
5. Failure to wipe couplings or coupling covers clean before putting them in place	_____	x100	_____
6. Failure to cycle remote cylinder gently	_____	x50	_____

Total Machinery Points Penalty _____

Total Safety Points Penalty _____

Total Points Penalty _____

APPENDICES

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FEDERAL REGISTER

VOLUME 35 NUMBER 4

Wednesday, January 7, 1970 • Washington, D.C.

Title 29—LABOR

Chapter XIII—Bureau of Labor Standards, Department of Labor

PART 1500—CHILD LABOR REGULATIONS, ORDERS, AND STATEMENTS OF INTERPRETATION

Hazardous Occupations in Agriculture

On October 9, 1969, there was published in the FEDERAL REGISTER a proposal to revise Subpart E–1 of Part 1500 of Title 29 of the Code of Federal Regulations declaring certain occupations in agriculture to be particularly hazardous for the employment of children below the age of 16. After consideration of all oral and written matter presented in response to the proposal, Subpart E–1 of Part 1500 of Title 29 of the Code of Federal Regulations is revised in the manner set out below.

This revision will be effective January 1, 1970, or 30 days after publication in the FEDERAL REGISTER, whichever is later. In the event the effective date is subsequent to January 1, 1970, the present rules in Subpart E–1 shall be effective between January 1, 1970, and the effective date of this document.

Subpart E–1 is revised to read as follows:

Subpart E–1—Occupations in Agriculture Particularly Hazardous for the Employment of Children Below the Age of 16

Sec.

1500.70 Purpose and scope.
1500.71 Occupations involved in agriculture.
1500.72 Exemptions.

AUTHORITY: The provisions of this Subpart E–1 issued under secs. 12, 13, 18, 52 Stat. 1067, 1069, as amended; 29 U.S.C. 212, 213, 218.

§ 1500.70 Purpose and scope.

(a) *Purpose.* Section 13(c)(2) of the Fair Labor Standards Act of 1938, as amended (29 U.S.C. 213(c)(2)) states that the "provisions of section 12 [of the Act] relating to child labor shall apply to an employee below the age of 16 employed in agriculture in an occupation that the Secretary of Labor finds and declares to be particularly hazardous for the employment of children below the age of 16, except where such employee is employed by his parent on a farm owned or operated by such parent or person." The purpose of this subpart is to apply this statutory provision.

(b) *Exception.* This subpart shall not apply to the employment of a child below the age of 16 by his parent or by a person standing in the place of his parent on a farm owned or operated by such parent or person.

(c) *Statutory definitions.* As used in this subpart, the terms "agriculture," "employer," and "employ" have the same meanings as the identical terms contained in section 3 of the Fair Labor Standards Act of 1938, as amended (29 U.S.C. 203) which are as follows:

(1) "Agriculture" includes farming in all its branches and among other things includes the cultivation and tillage of soil, dairying, the production, cultivation, growing, and harvesting of any agricultural or horticultural commodities (including commodities defined as agricultural commodities in section 15(g) of the Agricultural Marketing Act, as amended), the raising of livestock, bees, fur-bearing animals, or poultry, and any practices (including any forestry or lumbering operations) performed by a farmer or on a farm as an incident to or in conjunction with such farming operations, including preparation for market, delivery to storage or to market or to carriers for transportation to market.

(2) "Employer" includes any person acting directly or indirectly in the interest of an employer in relation to an employee but shall not include the United States or any State or political subdivision of a State (except with respect to employees of a State or a political subdivision thereof, employed (i) in a hospital, institution, or school referred to in the last sentence of section (r) of the Act, or (ii) in the operation of a railway or carrier referred to in such sentence), or any labor organization (other than when acting as an employer), or anyone acting in the capacity of officer or agent of such labor organization. (iii) "Employ" includes to suffer or permit to work.

§ 1500.71 Occupations involved in Agriculture.

(a) *Findings and declarations of fact as to specific occupations.* The following occupations in agriculture are particularly hazardous for the employment of children below the age of 16:

(1) Operating a tractor of over 20 PTO horsepower, or connecting or disconnecting an implement or any of its parts to or from such a tractor.

(2) Operating or assisting to operate (including starting, stopping, adjusting, feeding, or any other activity involving physical contact associated with the operation) any of the following machines:

(i) Corn picker, cotton picker, grain combine, hay mower, forage harvester hay baler, potato digger, or mobile pea viner;

(ii) Feed grinder, crop dryer, forage blower, auger conveyor, or the unloading mechanism of a nongravity-type self-unloading wagon or trailer; or

(iii) Power post-hole digger, power post driver, or nonwalking type rotary tiller.

(3) Operating or assisting to operate (including starting, stopping, adjusting, feeding, or any other activity involving physical contact associated with the operation) any of the following machines:

(i) Trencher or earthmoving equipment;

(ii) Fork lift;

(iii) Potato combine; or

(iv) Power-driven circular, band, or chain saw.

(4) Working on a farm in a yard, pen, or stall occupied by a:

(i) Bull, boar, or stud horse maintained for breeding purposes; or

(ii) Sow with suckling pigs, or cow with newborn calf (with umbilical cord present).

(5) Felling, bucking, skidding, loading, or unloadnig timber with butt diameter of more than 6 inches.

(6) Working from a ladder or scaffold (painting, repairing, or building structures, pruning trees, picking fruit, etc.) at a height of over 20 feet.

(7) Driving a bus, truck, or automobile when transporting passengers, or riding on a tractor as a passenger or helper.

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(8) Working inside:

(i) A fruit, forage, or grain storage designed to retain an oxygen deficient or toxic atmosphere;

(ii) An upright silo within 2 weeks after silage has been added or when a top unloading device is in operating position;

(iii) A manure pit, or

(iv) A horizontal silo while operating a tractor for packing purposes.

(9) Handling or applying (including cleaning or decontaminating equipment, disposal or return of empty containers, or serving as a flagman for aircraft applying) agricultural chemicals classified under the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 135 et seq.) as Category I of toxicity, identified by the word "poison" and the "skull and crossbones" on the label; or Category II of toxicity, identified by the word "warning" on the label;

(10) Handling or using a blasting agent, including but not limited to, dynamite, black powder, sensitized ammonium nitrate, blasting caps, and primer cord; or

(11) Transporting, transferring, or applying anhydrous ammonia.

(b) *Occupational definitions.* In applying machinery, equipment, or facility terms used in paragraph (a) of this section, the Bureau of Labor Standards will be guided by the definitions contained in the current edition of "Agricultural Engineering", a dictionary and handbook, Interstate Printers and Publishers, Danville, Ill. Copies of this dictionary and handbook are available for examination in Regional Offices of the Bureau of Labor Standards, U.S. Department of Labor

§ 1500.72 Exemptions.

(a) *Student-learners.* The findings and declarations of fact in § 1500.71(a) shall not apply to the employment of any child as vocational agriculture student-learner in any of the occupations described in subparagraph (1), (2), (3), (4), (5), or (6) of § 1500.71(a) when each of the following requirements are met: (1) The student-learner is enrolled in a vocational education training program in agriculture under a recognized State or local educational authority, or in a substantially similar program conducted by a private school; (2) such student-learner is employed under a written agreement which provides: (i) that the work of the student-learner is incidental to his training; (ii) that such work shall be intermittent, for short periods of time, and under the direct and close supervision of a qualified and experienced person; (iii) that safety instruction shall be given by the school and correlated by the employer with on-the-job training; and (iv) that a schedule of organized and progressive work processes to be performed on the job have been prepared; (3) such written agreement contains the name of the student-learner, and is signed by the employer and by a person authorized to represent the educational authority or school; and (4) copies of each such agreement are kept on file by both the educational authority or school and by the employer.

(b) *Federal Extension Service.* The findings and declarations of fact in § 1500.71(a) shall not apply to the employment of a child under 16 years of age in those occupations in which he has successfully completed one or more training programs described in subparagraph (1), (2), or (3) of this paragraph provided he has been instructed by his employer on safe and proper operation of the specific equipment he is to use; is continuously and closely supervised by the employer where feasible; or, where not feasible, in work such as cultivating, his safety is checked by the employer at least at midmorning, noon, and midafternoon.

(1) *4–H tractor operation program.* The child is qualified to be employed in an occupation described in subparagraph (1) of § 1500.71(a) provided:

(i) He is a 4–H member;

(ii) He is 14 years of age, or older;

(iii) He is familiar with the normal working hazards in agriculture;

(iv) He has completed a 10-hour training program which includes the following units from the manuals of the 4–H tractor program conducted by, or in accordance with the requirements of, the Cooperative Extension Service of a land grant university:

(*a*) First-Year Manual:

Unit 1—Learning How to Be Safe;
Unit 4—The Instrument Panel;
Unit 5—Controls for Your Tractor;
Unit 6—Daily Maintenance and Safety Check; and
Unit 7—Starting and Stopping Your Tractor;

(*b*) Second-year Manual:

Unit 1—Tractor Safety on the Farm;

(*c*) Third-Year Manual:

Unit 1—Tractor Safety on the Highway;
Unit 3—Hitches, Power-take-off, and Hydraulic Controls;

(v) He has passed a written examination on tractor safety and has demonstrated his ability to operate a tractor safely with a two-wheeled trailed implement on a course similar to one of the 4–H Tractor Operator's Contest Courses; and

(vi) His employer has on file with the child's records kept pursuant to Part 516 of this title (basically, name, address, and date of birth) a copy of a certificate acceptable by the Bureau of Labor Standards, signed by the leader who conducted the training program and by an Extension Agent of the Cooperative Extension Service of a land grant university to the effect that the child has completed all the requirements specified in subdivisions (i) through (v) of this subparagraph.

(2) *4–H machine operation program.* The child is qualified to be employed in an occupation described in subparagraph (2) of § 1500.71(a) providing:

(i) He satisfies all the requirements specified in subdivisions (i) through (v), of subparagraph (1) of this paragraph;

(ii) He has completed an additional 10-hour training program on farm machinery safety, including 4–H Fourth-Year Manual, Unit 1, Safe Use of Farm Machinery;

(iii) He has passed a written and practical examination on safe machinery operation; and

(iv) His employer has on file with the child's records kept pursuant to Part 516 of this title (basically, name, address, and date of birth) a copy of a certificate acceptable by the Bureau of Labor Standards, signed by the leader who conducted the training program and by an Extension Agent of the Cooperative Extension Service of a land grant university, to the effect that the child has completed all of the requirements specified in subdivisions (i) through (iii) of this subparagraph.

(3) *Tractor and machine operation program.* The child is qualified to be employed in an occupation described in subparagraphs (1) and (2) of § 1500.71(a) providing:

(i) He is 14 years of age, or older;

(ii) He has completed a 4-hour orientation course familiarizing him with the normal working hazards in agriculture;

(iii) He has completed a 20-hour training program on safe operation of tractors and farm machinery, which covers all material specified in subparagraphs (1)(iv) and (2)(ii) of this paragraph.

(iv) He has passed a written examination on tractor and farm machinery safety, and has demonstrated his ability to operate a tractor with a two-wheeled trailed implement on a course similar to a 4–H Tractor Operator's Contest Course, and to operate farm machinery safely.

(v) His employer has on file with the child's records kept pursuant to Part 516 of this title (basically, name, address and date of birth) a copy of a certificate acceptable by the Bureau of Labor Standards, signed by the volunteer leader who conducted the training program and by an Extension Agent of the Cooperative Extension Service of a land grant university, to the effect that all of the requirements of subdivisions (i) through (iv) of this subparagraph have been met

(c) *Vocational agriculture training.* The findings and declarations of fact in § 1500.71(a) shall not apply to the employment of a vocational agriculture student under 16 years of age in those occupations in which he has successfully completed one or more training programs described in subparagraph (1) or (2) of this paragraph and who has been instructed by his employer in the safe and proper operation of the specific equipment he is to use, who is continuously and closely supervised by his employer where feasible or, where not feasible, in work such as cultivating, whose safety is checked by the employer at least at midmorning, noon, and midafternoon, and who also satisfies whichever of the following program requirements are pertinent:

(1) *Tractor operation program.* The student is qualified to be employed in an

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occupation described in subparagraph (1) of § 1500.71(a) provided:

(i) He is 14 years of age, or older;

(ii) He is familiar with the normal working hazards in agriculture;

(iii) He has completed a 15-hour training program which includes tht required units specified in the Vocational Agriculture Training Program in Safe Tractor Operation, outlined by the Office of Education, U.S. Department of Health, Education, and Welfare and acceptable by the U.S. Department of Labor. The training program is outlined in Special Paper No. 8, April 1969, prepared at Michigan State University, East Lansing, Mich., for the Office of Education. Copies of this training program outline are available for examination in the Regional Offices of the Bureau of Labor Standards, U.S. Department of Labor, and a copy may be obtained from the Office of Education, U.S. Department of Health, Education, and Welfare, Washington, D.C. 20202.

(iv) He has passed both a written test and a practical test on tractor safety including a demonstration of his ability to operate safety a tractor with a two-wheeled trailed implement on a test course similar to that described in the Vocational Agriculture Training Program in Safe Tractor Operation, outlined by the Office of Education, U.S. Department of Health, Education, and Welfare; and

(v) His employer has on file with the child's records kept pursuant to Part 516 of this title (basically, name, address, and date of birth) a copy of a certificate acceptable by the Bureau of Labor Standards, signed by the Vocational Agriculture teacher who conducted the program to the effect that the student has completed all the requirements specified in subdivisions (i) through (iv) of this subparagraph.

(2) *Machinery operation program.* The student is qualified to be employed in an occupation described in subparagraph (2) of § 1500.71(a) provided he has completed the Tractor Operation Program described in subparagraph (1) of this paragraph and:

(i) He has completed an additional 10-hour training program which includes the required units specified in the Vocational Agriculture Training Program in Safe Farm Machinery Operation, outlined by the Office of Education, U.S. Department of Health, Education, and Welfare and approved by the U.S. Department of Labor;

(ii) He has passed both a written test and a practical test on safe machinery operation similar to that described in the Vocational Agriculture Training Program in Safe Farm Machinery Operation, outlined by the Office of Education, U.S. Department of Health, Education, and Welfare; and

(iii) His employer has on file with the child's records kept pursuant to Part 516 of this title (basically, name, address and date of birth) a copy of a certificate acceptable by the Bureau of Labor Standards, signed by the Vocational Agriculture teacher who conducted the program to the effect that student has completed all the requirements specified in subdivisions (i) and (ii) of this subpargaraph.

(d) *Agency review.* The provisions of paragraphs (a), (b), and (c) of this section will be reviewed and reevaluated before January 1, 1972. In addition, determinations will be made as to whether the use of protective frames, crush resistant cabs, and other personal protective devices should be made a condition of these exemptions.

Signed at Washington, D.C., this 31st day of December 1969.

GEORGE P. SHULTZ,
Secretary of Labor.

[F.R. Doc. 70-189; Filed, Jan. 6, 1970; 8:46 a.m.]

GPO 887-703

Appendix 2

☆ U. S. GOVERNMENT PRINTING OFFICE: 1970—378-063

CERTIFICATE OF TRAINING

This is to certify that Certificate No. CES 6002

(Name) (Date of birth) Date

(Address) (Zip Code)

is 14 years of age or more and has successfully completed the (4-H or Vo-Ag) training program and examination in

(Cross out one) 1. Tractor Operation
2. Tractor and Machinery Operation

as specified by the U.S. Department of Labor in the Agricultural Hazardous-Occupations Order (Subpart E-1 of 29 CFR, Part 1500) pertaining to the employment of youth under 16 years of age.

Certifying Authority (Extension Agent or Vocational Agriculture teacher only) | Person who conducted the training program

SAMPLE CERTIFICATE

SAMPLE CERTIFICATE

TO THE TRAINEE

1. You may apply for and accept employment as (a) a tractor operator as described in item 1 on the reverse side of this sheet, or (b) as both a tractor and machinery operator as described in items 1 and 2 on the reverse side of this sheet, if certified for both the tractor and machinery operation. This certificate is acceptable by the U. S. Department of Labor as proof of training.

2. You may not be employed in any of the occupations listed in items 3 through 11 described on the reverse side of this sheet.

3. This certificate does not certify training in adjustment of equipment or your proficiency in its operation, nor does it certify that you know how to safely operate any particular make or model of tractor or machine.

4. It is the responsibility of your employer to instruct you on the safe and proper operation of the equipment you are to use.

5. The U.S. Department of Labor requires that your employer "maintain close supervision where feasible, or, where not feasible, in work such as cultivating, the employer or his representative check on your progress at least midmorning, noon, and midafternoon."

6. Any accident resulting in an injury to you should be reported by your employer to the proper authority including the certifying authority who signed this certificate.

7. The copy of this certificate marked "Employer's Copy" at the lower right corner, must be kept on file by your employer.

Trainee's Copy

Reverse Side of Sheet

OCCUPATIONS IN AGRICULTURE PARTICULARLY HAZARDOUS FOR THE EMPLOYMENT OF CHILDREN BELOW THE AGE OF 16

Item (1). Operating a tractor of over 20 P.T.O. horsepower, or connecting or disconnecting an implement or any of its parts to, or from such a tractor.

Item (2). Operating or assisting to operate (including starting, stopping, adjusting, feeding, or any other activity involving physical contact associated with the operation) any of the following machines:

(i) Corn picker, cotton picker, grain combine, hay mower, forage harvester, hay baler, potato digger, or mobile pea viner.

(ii) Feed grinder, crop dryer, forage blower, auger conveyor, or the unloading mechanism of a nongravity-type self-unloading wagon or trailer, or

(iii) Power post-hole digger, power post driver, or nonwalking-type rotary tiller.

Item (3). Operating or assisting to operate (including starting, stopping, adjusting, feeding, or any other activity involving physical contact associated with the operation) any of the following machines:

(i) Trencher or earthmoving equipment.

(ii) Fork lift.

(iii) Potato combine, or

(iv) Power-driven circular, band, or chain saw.

Item (4). Working on a farm in a yard, pen, or stall occupied by a:

(i) Bull, boar, or stud horse maintained for breeding purposes; or

(ii) Sow with suckling pigs, or cow with newborn calf (with umbilical cord present).

Item (5). Felling, bucking, skidding, loading, or unloading timber with butt diameter of more than 6 inches.

Item (6). Working from a ladder or scaffold (painting, repairing, or building structures, pruning trees, picking fruit, etc.) at a height of over 20 feet.

Item (7). Driving a bus, truck, or automobile when transporting passengers, or riding on a tractor as a passenger or helper.

Item (8). Working inside:

(i) A fruit, forage, or grain storage designed to retain an oxygen deficient or toxic atmosphere;

(ii) A upright silo within 2 weeks after silage has been added or when a top unloading device is in operating position;

(iii) A manure pit; or

(iv) A horizontal silo while operating a tractor for packing purposes.

Item (9). Handling or applying (including cleaning or decontaminating equipment, disposal, or return of empty containers), or serving as a flagman for aircraft applying, agricultural chemicals classified under the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 135 et seq.) as Category I of toxicity indentified by the word "poison" and the "skull and crossbones" on the label; or Category II of toxicity identified by the word "warning" on the label.

Item (10). Handling or using a blasting agent, including but not limited to, dynamite, black powder, sensitized ammonium nitrate, blasting caps, and primer cord; or

Item (11). Transporting, transferring, or applying anhydrous ammonia.

SAMPLE CERTIFICATE